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1882

ECONOMIC RELATIONS
OF
WISCONSIN BIRDS.

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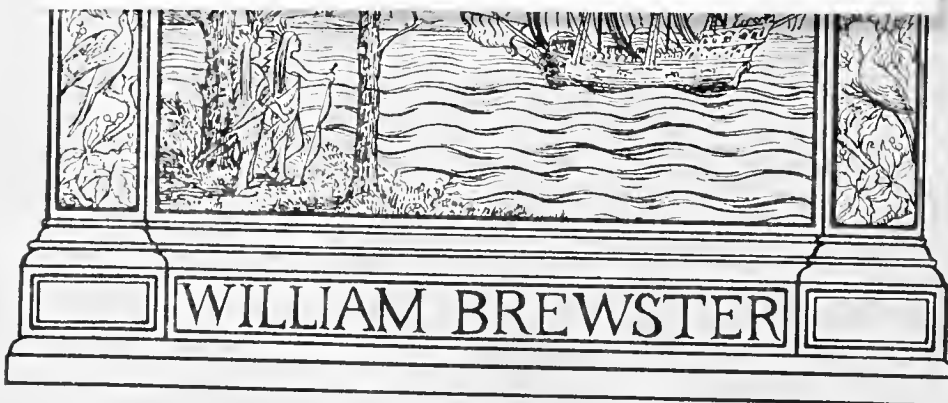
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Wisconsin Geol. Surv. 4 of 11
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CHAPTER XI.

ECONOMIC RELATIONS OF WISCONSIN BIRDS

By F. H. KING.

PREFATORY LETTER.

RIVER FALLS, WIS., Nov. 6, 1882.

Prof. T. C. CHAMBERLIN,

Chief Geologist:

Herewith I transmit, in compliance with your request, a report on the Economic Relations of the Birds of Wisconsin, to be published under the auspices of the Wisconsin Geological Survey.

The field work, which forms the basis of this report, was commenced at your suggestion, as you are aware, in July, 1873, and was prosecuted, as time could be devoted to it, until October, 1877. The funds which could be appropriated to this work did not permit of the collection of materials from the various portions of the state, consequently the data presented were gleaned, very largely, from a collection of birds obtained in Walworth, Jefferson, Green Lake, Waushara, Waupaca and Price counties, a territory which lies well back from the main water routes, along which the strongest currents of the stream of purely migratory species are likely to be found. This fact will doubtless explain in part the conspicuous absence of personal observations relative to species which have been reported as abundant in contiguous territory. The same conditions which circumscribed the field of observation also limited the time which could be devoted to field work, to the months of July and August and the early part of September, and while an effort was made, with a degree of success, to secure specimens at other times of the year, yet the report has lost, in a measure, that roundness and fullness which could have been desired.

The facts recorded in the report were obtained from an examination of the contents of the stomachs of over eighteen hundred birds, sixteen hundred and eight of which contributed results which have been incorporated in the report.

The contents of one-half of the stomachs were examined under the hand-lens on the day they were obtained, while the contents of seven hundred and fifty were transferred at once to small apothecary phials containing alcohol, and were carefully labeled with a tag. This material I was permitted to study much more in detail through the kindness of Prof. J. H. Comstock, of Cornell University, who granted me a seat in the Entomological Laboratory, together with the free use of specimens and apparatus. I desire to express here, too, my appreciation of the personal assistance, besides that coming from a sojourn of six months in the sunshine of a warm heart, which Prof. Comstock was able to give me. He should in no sense, however, be held responsible for errors which may have occurred in the identification of insects found among the food of the birds.

The examination of the material which had been collected was completed in June, 1878, and the report essentially completed before the middle of the following August, but, knowing that it would not be needed for publication im-

mediately, I preferred to retain the manuscript until the latest possible date in order to retouch it as might seem desirable. This has been done so far as practicable. The valuable results obtained by Prof. S. A. Forbes in regard to the food of birds of Illinois has been included, and the whole nomenclature has been made to conform with Dr. Coues' new "Check List of North American Birds."

Following my own notes on the food of each species examined, there have been given such other apparently authentic records of food as could be obtained. This supplementary information is far from being as complete as I had hoped to make it, and I fear not so accurately transferred as it should have been, for it has been impracticable to compare the transcript with the originals. I regret this the more, since the items were jotted down during the odd moments which fell between other absorbing duties.

The amount of specific information which it has been possible to present in regard to the food of our birds may seem unduly small compared with the amount of material which has been examined. Larger results might have been obtained had the materials, after having been classified in a general way, been subjected to a careful examination by entomologists expert in the various departments. Birds rarely swallow an insect of any size without taking especial care to severely mutilate it first, and I have no doubt that the bird has, in his own mind, the best of reasons for doing so. One may easily imagine the commotion which might come of introducing an able-bodied ground-beetle or a centipede grown expert in elbowing his way through all sorts of tortuous and impassable galleries. It is this fragmentary character of the food which has made it so difficult to classify the insects which had been eaten by the birds obtained. But had it been possible to identify specifically the 7,663 insects, etc., taken from the stomachs of the 1,608 birds, this would have been by far the smallest part of the task set, for then it would be required to command a full and broad knowledge of the economic relations of the insects eaten. But with this difficulty solved we must recognize still another of greater magnitude and higher degree.

Because of these great difficulties inherent in the task itself, and the ample grounds they present for difference of opinion in regard to final conclusions, it has seemed very desirable that there should be presented some of those general considerations which have served as guides to the classification adopted. These considerations are presented as an introduction to the body of the report.

There remains now the pleasant duty of thanking you for the privilege of having struggled with a difficult task, and, while the hopes you have entertained may find in this report but a faint realization, it is trusted that enough of real value may be found in it to repay the labor devoted to its preparation.

Very respectfully yours,

F. H. KING.

INTRODUCTION.

The discordant views held by prominent ornithologists and entomologists, in regard to the value of birds as insect destroyers, and particularly in regard to the actual and comparative value of certain species, prove conclusively that some of them have reached their conclusions on insufficient or false data. For this reason, and because it appears that many more facts must be gleaned and collated before final conclusions in regard to the economic value of birds can be reached, it is deemed advisable to consider briefly, as introductory to what follows, some of the more important factors which should enter into the solution of the problems of economic ornithology.

The most difficult and intricate problem of economic ornithology is that of the food of birds. In the discussion of this question it will be most convenient to bring that which birds eat under the two heads, (1) *Vegetation and Vegetable Matter*, and (2) *Animals and Animal Matter*. The food of birds thus grouped must be further identified as belonging to one or the other of the following classes:

- (1) *That, the consumption of which is, on the whole, a service to man.*
- (2) *That, the consumption of which is, on the whole, an injury to man.*

To determine what birds do, or may under forced conditions, eat is certainly a very difficult question, and many of the problems which must be solved before their food can be properly classified as indicated embrace the extreme of intricacy. That this classification must be made before final conclusions can be reached, I think all will agree; that such a classification can ever be made complete and unquestionable, there are grave reasons for doubting; but that a desirable approximation to completeness is possible, we may feel confident.

So much is yet to be learned in regard to the real and potential industrial relations of the plants and animals affected by birds, that whatever may now be said upon the subject must be regarded as open to modification by more detailed and careful future work.

Beneficial services on the part of birds may be stated under the following propositions:

- (1) *A bird renders a service when it is injurious or destructive to plants which are to be regarded detrimental.* This may occur when the bird consumes the foliage, buds, inner bark, blossoms or seeds of injurious plants.

The principal service which our birds render in this direction is in the consumption of the seeds of weeds; and the number which they destroy in the course of a season is very great. From the stomach and crop of one Carolina Dove were taken 4,016 seeds of the common pigeon grass, *Setaria glauca*. The service which a bird renders in this line, however, is not to be regarded as always proportionate to the number of seeds which it consumes, for the mere act of cultivation, necessary to many crops, so effectually controls these weeds that but little work is left for birds to do. Birds, therefore, which possess many very serious traits, and have only the habit of feeding upon the seeds of weeds in their favor, must be looked upon as of doubtful utility.

- (2) *A bird renders a service when it feeds upon injurious mammals.* Squirrels, gophers, rats, mice, and hares are the principal ones, regarded as noxious, which are preyed upon by our birds. They are among the smallest, the most prolific, and the most destructive of mammals. All of them are largely herbivorous or frugivorous, but some of them are somewhat carnivorous. All are familiar with the havoc which rats often make among young chickens and ducks. The ground squirrels are said to feed occasionally upon insects and upon mice. Occasionally, at least, the little red squirrel plunders birds' nests of their eggs. In June of 1878, as Prof. W. A. Kellerman and myself were passing through the cemetery at Ithaca, N. Y., our attention was attracted to an evergreen, standing near the walk, by a pair of Robins, which were dashing wildly about among its branches. On examining the tree, the nest of the birds was discovered, and just below it sat a Chickaree eating one of the Robin's eggs.

An instance similar to the above is mentioned by Edgar A. Mearns, in the Bulletin of the Essex Institute, Vol. X, 1878. He says: "Among the Robin's worst enemies may be ranked the red squirrels (*Sciurus hudsonius*), for, though their young are subject to the attacks of Crows, Jays, and particularly to the rav-

ages of the black snake (*Rescaurion constrictor*), yet none of these enemies inflict as much injury as the squirrels, because, not only do they seek out and devour the eggs, but the young are also eaten; and their numbers are in excess. . . . On the morning in question, a red squirrel came a considerable distance out of the woods, ascended to this nest, and would have destroyed all the young ones had not the parent returned just at the critical moment." The Robin succeeded in driving the squirrel away, but not until one of her young had been eaten.

In the spring of 1879 I placed the young of the Chipping Sparrow in the cage with a young pet flying squirrel (*Sciuropterus volucella*). The bird was seized with energy and killed but not eaten.

How general this practice among squirrels may be I do not know; it suggests, however, that the little red squirrel and its nearer allies may be formidable enemies of nearly all our small woodland birds.

The fact, too, that rats and ground squirrels are carnivorous, to some extent, suggests that these may be destructive to birds which nest upon the ground in fields and on the prairies. Mice are preyed upon to a considerable extent by some of the Hawks, and Owls, and probably also by the Sand-hill Crane, but whether birds of prey are especially serviceable in destroying squirrels and gophers may be questionable.

(3) *A bird does us a benefit when it feeds upon injurious birds.* This head is introduced here, not because any of our birds are known at present to render a service in this direction, but because it suggests a field in which further observation is needed.

(4) *A bird assists us when it feeds upon injurious reptiles.* Of the reptiles preyed upon by birds, our larger snakes are the only ones to be regarded as noxious. Snakes that are not venomous have been classed among beneficial animals, because they feed to some extent upon mice and insects. This classification, however, so far as it includes the larger species of snakes, appears to be, at present, unwarrantable. The fact that snakes also eat small birds and birds' eggs, toads, frogs, salamanders, and some of them fish, is conclusive proof that they do some injury. While my own observations indicate that both insects and mice are eaten by them, yet frogs and toads appear to form by far the larger part of their food, at least, that of our common garter snake. From the stomach of a large striped snake (*Eutainia sirtalis*) were taken eleven ground beetles, two elaters, one lamellicorn beetle, three caterpillars, one millipede, and one large toad. Leaving out of this account the toad, it will be seen that, in this particular instance, the snake had done a greater injury than a service, for the ground beetles, usually regarded as beneficial, nearly double in number all the other insects combined. The fact that during the season when insects are abundant, snakes are often found with their stomachs entirely empty, suggests that, with some species, at least, insects are only make-shifts for food. It should be observed in this connection that all snakes are capable of enduring a long fast without apparently suffering any very great inconvenience. If, then, it is true that insects are only eaten in default of other food, the services of snakes in this direction must be much smaller than might otherwise be expected.

Our frogs and toads in the adult stage, so far as is known, are entirely insectivorous, and are, therefore, harmless, except so far as they may be destructive to useful insects. Toads are nocturnal in their habits and feed upon the ground in gardens and fields where there are few animals, except the shrews and moles, to take their place. Some of the frogs, too, spend the summer in fields and meadows where birds are few, and consequently have a special work

to perform. Few birds, and certainly no snake, can be more serviceable, as insect destroyers, than these animals. The facility with which some snakes climb trees, and the stealthiness with which all may approach their prey upon the ground, give them great advantage over birds during the breeding season. That the common striped snake will devour even large mature birds, when it can obtain them, is proved by an instance which came under my observation last summer. On returning to camp, after a morning's excursion, a large striped snake was seen in the act of swallowing a Downy Woodpecker, which, with several other birds, had been thrown upon the ground after its stomach had been removed for examination. Only the tail feathers were protruding from the snake's mouth and all of the feathers were intact. The same snake had already swallowed a full-grown Catbird, with its entire plumage, and having only its stomach removed. The fact that a snake is sufficiently strong to seize and hold large toads and frogs indicates that they are abundantly able to hold any of our common birds, provided they come within their grasp.

Although ten or more species of our birds prey to some extent upon snakes, these birds are either destructive to other birds, or to frogs and toads, or to both; it does not follow, therefore, that their services should be retained simply because they are destructive to snakes. Snakes, owing to their slow movements, are much more easily controlled by direct means than most other animals.

(5) *A bird renders a service when it feeds upon insects which are injurious or destructive to useful animals, plants or materials, and which are not extensively destructive to noxious forms of life.* It is in the destruction of the members of this group that birds are chiefly serviceable, not only because insects are among the most prolific and the most destructive forms of life with which we have to contend, but because their small size and their habits make it very difficult to oppose them by any direct means. While, as entomologists have claimed, the most potent checks against these animals are among the members of their own class, yet, that these are not adequate to our needs, is conclusively proved by the results which have invariably followed from the wholesale slaughter to which birds have been subjected from time to time in different countries. Wherever the English Sparrow, the bird so much decried in our country of late, has been exterminated in Europe, noxious insects are said to have followed in such abundance that it has not only been gladly reinstated, but is now protected because it accomplishes what parasitic and predaceous insects are unable to do. When it is argued that birds feed indiscriminately upon beneficial and noxious insects, it should be observed that predaceous insects do the same, and that parasites have their parasitic foes.

Birds are insignificant in numbers when compared with the abundance of parasitic and predaceous insects, but their larger size, their active habits, their longer lives, the greater facility with which they move about, and the greater range of country over which they roam, go far toward compensating for smaller numbers. It should be added, also, that birds, either in one place or in another, are consuming insects throughout the year, while, in the temperate zones, predaceous and parasitic insects do nothing during one-half of that time. No insect is so large but that any bird may destroy it while it is passing through one or more of its stages, and few are so small as not to attract the attention of many of our birds. The White-Bellied Swallow captures on the wing plant-lice and flies, smaller than the wheat midge. The Purple Finch, and some of the Warblers, feed extensively upon plant-lice. Chalcidian and other parasitic flies, less than a tenth of an inch long, have been taken from the stomach of several of

our birds, even from that of the Swamp Sparrow, a bird which rarely pursues its prey upon the wing and which is counted among the seed-eating forms.

The nocturnal habits, which so many insects possess, do not offer such absolute protection against birds as some appear to think. Lepidopterous insects, so many of which deposit their eggs under the cover of night, feed in the larval state, with some exceptions, during the day, and this is the longest and so the most dangerous period of their existence, as it is the most destructive. But even when hidden during the day, insects are not secure; birds have learned their hiding places and search them out, and some of them make this the business of their lives. The Woodpeckers, Nuthatches and Creepers capture those that have hidden beneath the bark and in the crevices on the trunks and branches of trees; Warblers, Vireos and Flycatchers destroy those that betake themselves to the undersides of leaves; and the Thrushes, Finches and Starlings pick up those that seek security upon the ground and among the grass. "Mimicry," though protective, doubtless, to some extent, does not lessen the service which birds render. It simply tends to throw the heaviest attacks upon the more conspicuous forms. But protective colors, forms and surfaces can hardly be as effectual against birds as against predaceous insects, for they survey their field from a more advantageous point of view, and they discriminate well objects both remote and close at hand. Besides, birds, and predaceous insects as well, learn to see as collectors learn to collect. They become experts in their business, and this is of as great an advantage to them as "mimicry" can be to other forms.

While many of our troublesome insects spend their larval states in the stems of plants, in various fruits or beneath the ground, feeding upon the roots of plants beyond the reach of most birds, yet even these, while searching for places in which to undergo their transformations, and in the winged state, are destroyed by birds in large numbers. If birds do not exterminate noxious insects, they nevertheless perform a serviceable mission by holding them within certain limits.

That an approximate estimate may be made of the amount of work which birds do in destroying insects, the table given below has been prepared. The first four columns are compiled from notes taken in Jefferson county, between July 31st and August 7, 1878; those in the last four columns are from notes taken in the vicinity of Ithaca, N. Y., in June of 1878. In each column, opposite the name of the species, is given the number of individuals which were observed in traveling the distance that is given near the foot of each column. The item, "Birds seen or heard, but not named," includes those individuals which were known to exist in the territory passed over, but which, for various reasons, could not be identified with certainty. The two series of observations are taken for the purpose of comparison in discussing another point. As will be seen further on, the different routes were chosen with reference to certain topographical features, in order that the combined results might include the peculiarities due to them. By referring to the table it will be seen that the average number of individuals observed per mile on the four trips in the two localities bear a remarkable closeness to one another, that for Jefferson being about 33 per mile, and that for the vicinity of Ithaca nearly 57 per mile. Since these results are so close to one another, they may be fairly assumed to represent a definite factor, for the respective localities, at the time the observations were taken.

Table of Observations on the Abundance of Birds.

NAME.	NUMBER OBSERVED.							
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Turdus migratorius	11			3	20	13	31	44
Turdus fuscescens					2		2	4
Minus carolinensis	2	8	3	2	12		25	7
Sialia sialis	1	2			2	8	5	17
Parus atricapillus							9	
Sitta carolinensis	3	7	2			1	2	3
Troglodytes ædon						1		5
Eremophila alpestris								3
Cistothorus stellaris	1							
Dendroeca æstiva					1	2	5	5
Geothlypis trichas			1	3				
Setophaga ruticilla	2	15	5		2			
Pyrranga rubra	1	3						
Hirundo erythrogastra horreorum	5	5				12	7	20
Tachycineta bicolor		2						
Petrochelidon lunifrons					2	12	10	55
Cotyle riparia								13
Progne subis	2			1				
Ampelis cedrorum			8		4	7	12	4
Vireo olivaceus	1	13	13				1	
Vireo gilvus	1			3				
Vireo flavifrons			10	4				
Lanius ludovicianus excubiteroides	1							
Astragalinus tristis	9	27	5	4	6	28	32	44
Poœcetes gramineus	5			10		16	19	18
Melospiza fasciata	6	5	8	17	7	33	23	73
Melospiza palustris			1					
Spizella domestica	3	1	1		7	33	17	36
Spizella agrestis (shot)				2				
Passerina cyanea		5				2	3	3
Pipilo erythrophthalmus		3	3					
Dolichonyx oryzivorus		18	3			5	22	52
Molothrus ater					2			10
Agelæus phœniceus		1			12		10	12
Sturnella magna	1	2			2	8	5	11
Icterus galbula					7	11	5	3
Quiscalus purpureus								2
Corvus frugivorus	1	2			3	10	8	28
Cyanocitta cristatus				1				
Tyrannus carolinensis	8			10	4	4		8
Sayornis fusca	2			4	2		22	11
Contopus virens	3	20	15	4			2	4
Empidonax minimus					1			
Chætura pelagica					4	3	13	12
Trochilus colubris	1	5	1	1		1	1	
Ceryle alcyon	2	7						
Coccyzus erythrophthalmus					2		1	
Picus villosus	2		1					
Picus pubescens		1						
Sphyrapicus varius	1	2	4					
Melanerpes erythrocephalus	4	2				3		3
Colaptes auratus	7			6	2		2	1
Circus cyaneus hudsonicus ..				5				
Falco sparverius					1			
Hawk		2					2	
Zenaidura carolinensis	5						4	1
Bonasa umbella			10					
Ægialitis vociferus	17	2						
Tringoides macularius	1	11					4	3
Bartramia longicauda	2							
Ardea herodias	2							
Butorides verescens	2	3						
Rallus virginianus	1					1	1	
Podilymbus podiceps	1							
Birds seen or heard, but not named	20	36	18	15	20	69	100	101
Total number of birds observed ...	137	141	112	95	127	282	405	616
Number of miles traveled	4	5	3	3	21/4	5	7	11
Average number of birds per mile	34	28	37	32	56	56	58	55
Total number of species	35	27	18	17	23	22	30	32

Total average per mile in Jefferson county is about 33.
Total average per mile in the vicinity of Ithaca, New York, is nearly 57.

It will probably be far within the limits of truth, if it is assumed that the average number of birds observed per mile represents only one-half the actual number which existed on each square mile at the time it was crossed. At this rate the bird population of Jefferson would be 66 per square mile, while that of the vicinity of Ithaca would be 114 per square mile. This would give for Jefferson county a total bird population of 30,096, and for an equal area in the vicinity of Ithaca, 51,984. At the rate of 66 per square mile, an area somewhat less than that of our state would have a population of 3,565,000.

From the stomach of a Passenger Pigeon were taken nine full-grown black crickets, and four grasshoppers over an inch long, together with two large caterpillars and one harvestman. From the stomach of a young Partridge, less than a week old, were taken thirteen caterpillars, seven harvestmen and one grub; from that of a Night-hawk were taken five small grasshoppers, eight large square-shouldered hemiptera, and ten scorpion bugs, none of which were less than three-fourths of an inch long. Nine grammes of insect debris were taken from the stomach of another Night-hawk. Three Golden-winged Woodpeckers had in their stomachs, respectively, 255, 220, and 200 ants. In the stomach of a Hairy Woodpecker were found the remains of eleven grubs of long-horned beetles and thirteen measuring worms. A Pewee, *Sayornis fuscus*, had in its stomach ten ichneumon flies, averaging over half an inch long, five small moths and one caddis fly. The actual amount of food which the above species eat during the day, if we except the Night-hawk, is probably more than three times that which was found in their stomachs. Fifty insects of the average size would certainly be a small daily allowance for the average bird. One hundred and twenty days is less than the time our summer residents are with us. At the rate assumed, each bird would consume 6,000 insects. This would give as the aggregate number of insects consumed by the birds calculated to occupy an area equal to that of our state, the enormous total of 21,384,000,000. Add to this amount the work which these birds do in their southern homes, and we have a low estimate of the influence they exert over insect life.

It should be borne in mind that less than half of our summer residents are included in the table, and that nothing whatever has been said in regard to the birds of passage which sweep the state twice every year. The insects which these birds eat will more than compensate for whatever other food those birds which have entered into our computation may consume.

(6) *A bird does us service when it feeds upon noxious mollusks.* In damp climates, such as exist in many parts of Europe, mollusks often become very abundant and very destructive to garden and field products. In the United States, however, but little injury from them appears to have been thus far realized; and in a climate like ours, but little apparently need be anticipated. The fact, however, that slugs have occasionally made destructive raids upon strawberry patches, should put us sufficiently on our guard to look into their possibilities for evil before we attempt to drive off or destroy their natural enemies. It may be remarked here, in passing, that a species of *Limax*, common in the grass at Ithaca, N. Y., has several times been seen feeding upon ripe cherries that had fallen from the trees. Whether, as many slugs are known to do, this species will in damp days ascend the trees to feed, is a question worthy of study.

Mollusks, and other animals as well, may be, at times, extremely injurious even when, so far as their food is concerned, they are practically harmless. That terrible disease known as "flake-rot" or "water-rot," which has destroyed in a

single locality in Europe, during one season, 300,000 sheep, and which has ruined large herds of cattle, and which, under favorable circumstances, has even attacked man, is due to a parasite, *Faciola hepatica*. This parasite is believed by those who have studied its habits, to pass through one stage of its transformations in the bodies of fresh-water mollusks. If these mollusks are a necessary habitat of the fluke-rot parasite, whatever destroys them lessens the liabilities of its attacks. Quite a large number of birds and fishes and some insects feed upon fresh-water mollusks, but whether in so doing they are benefiting us, we cannot at present say.

(7) *A bird may render service by feeding upon noxious crustaceans and worms.* Crawfish have been so little studied in regard to their habits that an economic position cannot be satisfactorily assigned them at present. Prof. W. F. Bundy writes me in regard to their habits as follows:

“Crawfish feed on worms, small mollusks, insects that fall in their way, small fish, and in general any kind of animal food, especially carrion. They are industrious scavengers. This latter item, with the additional ones that they form a not inconsiderable part of food for fish, and their damage to meadows by burrowing, indicate where they come in the most direct relation to human interests.”

The river species he regards as beneficial. Those which burrow in meadows, building mud chimneys which become sun-baked and interfere quite seriously with mowing, he is in doubt in regard to, but inclines to the opinion that their services as scavengers more than offset the damage they do.

Crawfish are preyed upon to a considerable extent by various species of Herons and some other birds. The Cowbird is said to eat the intestinal worms voided by cattle and horses.

(8) *Birds are serviceable when they feed on carrion.* Ordinarily, in a country and climate like that of Wisconsin, there appears to be but little need for large carrion-eating animals. Birds of this class, therefore, which have other and very injurious tendencies, can hardly be tolerated in abundance merely for the purpose of consuming carrion.

The injurious relations of birds may likewise be stated in the following propositions:

(1) *A bird is harmful to us when it is injurious or destructive to useful plants.* This may occur when the bird feeds upon the inner bark, buds, foliage, blossoms, fruit, or seeds of useful plants.

It is in the destruction of cereals, either shortly after they are planted or when they are ripening, that our birds are chiefly injurious in this direction at present, but even here their injuries have rarely assumed alarming proportions. Quite a large number of birds feed upon small fruits, but those which do are in other respects almost exclusively insectivorous. Even the Cherry Bird and Baltimore Oriole, which horticulturists tell us should be exterminated in mid-cherry time, feed quite as much upon insects as upon fruits. The Yellow-bellied Woodpecker is said to feed upon the inner bark of orchard and ornamental trees. The Purple Finch and some other birds occasionally eat the buds of fruit trees; their injury, however, has thus far been trifling. In the forests, during the winter, buds form a large part of the food of quite a number of birds. From the stomach of a Partridge were taken, in October, 302 white birch buds. While the number of buds which this species consumes during the winter is doubtless very great, it is probable that its flesh will always amply compensate for the injury it does in this direction, to say nothing of the insects which it consumes during the summer.

It is only when forest-planting becomes a necessity that bud-eating birds, as such, can take the rank of enemies, unless, by any means, these birds should become very abundant. In any case, only the small bud-eaters, like the Purple Finch and some of the Linnets, whose small size render them valueless as food, and which, for this reason, would have to be controlled by the awarding of bounties or some similar means, need give us any apprehensions whatever.

(2) *A bird does us harm when it preys upon shrews, moles and bats.* These animals, owing to their insectivorous and nocturnal habits, and their, so far as known, inoffensive natures, are to be regarded as of great value. They are especially to be protected because they choose a time to feed when noxious insects are abroad in abundance and when their enemies are few. Birds, therefore, which are extensively destructive to them, unless they have some very desirable traits, are to be regarded as enemies.

Owls are the principal birds known to feed upon these animals.

(3) *A bird is harmful to us when it preys upon other beneficial birds and their eggs.* A species which makes a practice of preying upon birds' eggs or their young, or which has the ability and disposition to capture mature birds, must certainly do a very important work for us in compensation to be encouraged in agricultural districts, at least until after experience has proved that its services are needed to prevent an undue increase of certain birds. All of our Hawks, Owls, Shrikes and Crows are known to be, or may be suspected of being, more or less destructive to birds in one or more of their stages of development, but to what extent, observations, so far as they have been published, are too limited and indefinite to allow any very definite conclusions to be drawn.

(4) *A bird is harmful when it feeds upon lizards and perhaps our smallest species of snakes.* As the food of these animals probably consists almost entirely of insects, they are to be regarded as beneficial, until shown to be detrimental.

(5) *A bird is harmful when it feeds upon frogs, toads and salamanders.* Enough has already been said in regard to frogs and toads to show what their economic relations are, and how birds must be regarded which feed extensively upon them. Salamanders probably occupy a similar, though less important position.

(6) *A bird is detrimental when it feeds upon the parasites of noxious animals, and especially upon those of noxious insects.* Parasites are regarded as the most potent agents which serve to keep noxious insects within safe bounds, and that their influence is very great, there can be no doubt. This, however, is to be said in regard to them: Many, apparently, only become extremely abundant when the insects upon which they prey have assumed such numbers as often to commit wide-spread ravages. Their influence has a tendency toward spasmodic rather than steady action. They are, as it were, the last reserves which Nature holds back for those emergencies when favorable conditions of climate shall let loose upon the world such an abundance of insects as cannot be controlled by other means.

The fateful army-worm, whose history is so well given by Riley,¹ illustrates well what is meant. In spite of the combined action of its nine known parasites, this worm, at irregular intervals, marches its gigantic armies over fields of grass and grain, for a season, and then disappears.

Again, parasites do not stop the ravages of an insect at once as birds do. The larvæ which they infest are allowed to pass through the destructive period of their lives, apparently with appetites unimpaired. They save future rather than present crops, while birds do both.

¹ Second Annual Report, p. 37.

How far birds are destructive to parasitic insects cannot be stated with certainty at present. The fact, however, that the contents of not more than thirty-two out of six hundred stomachs, examined carefully under the microscope, gave any evidence of parasitic hymenoptera, and that, if we set aside the probably exceptional case of the Pewee, already mentioned, usually but one, or occasionally two of these insects were found in a stomach, indicates that this group of parasites is not preyed upon by birds to the same extent that other insects are. It should be said, however, that some sixteen species of birds are proved to feed upon these insects to some extent, and that these species represent Thrushes, Titmice, Warblers, Swallows, Flycatchers and Finches as well as the Hummers. Large birds, like the Robin and Chewink, as well as the small Kinglets and the Humming Bird, eat these hymenopterous friends. Birds, doubtless, destroy large numbers of parasites with the insects which they infest, but such a destruction is admissible.

(7) *A bird may be classed as an enemy in so far as it feeds upon beneficial predaceous insects, spiders and myriapods.* It is in the destruction of these forms that we are to apprehend the greatest injury from our birds. They are large, conspicuous, and, as a rule, easily captured. They are extremely numerous, and frequent every situation which a bird may visit. The majority of them, to obtain food, are obliged to lead roving lives, and are thus more exposed and consequently more liable to be discovered by birds than many of the plant-eating insects are. In the directness of their effect upon insect life, they take the same rank with birds, for when they secure their prey its devastations are at an end. Like birds, too, they feed more or less indiscriminately upon whatever insects they may capture; nor does this trait detract so much from their general usefulness as might be expected. It is, in fact, this habit which enables them to maintain a somewhat steady abundance even when the caprices of climate or an over-abundance of parasites nearly exterminates certain insects upon which they commonly feed. A parasitic insect confined to one, or at most to but a few, species, must fluctuate in abundance with it, and no matter how abundant or how destructive another insect may become, it is powerless to destroy it, or to save itself. With predaceous forms, however, this case is quite different, and their general tendency, like that of birds, is to maintain a steady, rather than a vacillating, abundance. Many of the wasps, the Tiger and Ground beetles, the Lady-birds, a few moths (Report of Department of Agriculture for 1879), the Asilus and Syrphian flies, many of the true Bugs, the Dragon-flies and Lace-wings, nearly all of the Spiders and many of the Myriapods, are representatives of this group, and, as will be seen beyond, all of them are destroyed to a greater or less extent by very many of our birds.

(8) *A bird does us harm when it feeds upon carrion insects.* How much of health we owe to these scavengers we can only imagine, but that they do exert a great influence in checking malarial diseases we have no reason to doubt. Fortunately for us, birds do not appear to be very destructive to these insects, especially in their larval states.

(9) *A bird is harmful when it eats beneficial worms.* In the light of the investigations made by Charles Darwin on the "Origin of Vegetable Mould," angle-worms, or earth-worms, appear to render an important service in the accumulation of this most essential material to the growth of shallow-rooted vegetation. Not a small number of our birds feed on angle-worms to some extent.

Hair-worms (Gordii) and some other similar forms are other members of this group, some of which are parasitic on grasshoppers and other insects, including

spiders, during their larval stages. In the adult stages they are found in the water and are there occasionally picked up by Snipes.

Considering some of the effects of entozoa in man in connection with Dr. Leidy's statement that "their (Gordii) bulk and weight are frequently greater than all the soft parts, including the muscles, of their living habitation; nevertheless, with this relatively immense mass of parasites, the insects jump about almost as freely as those not infested," there may be a chance for error in deciding just which species of these worms are beneficial and which are detrimental. If, in the case of the grasshoppers, the parasites do not kill their hosts nor prevent them from laying perfect eggs, they must be classed as detrimental, for their presence in the insect must have the effect of increasing the amount of food consumed by it. It amounts to the same thing as hair-worms eating vegetation; but the reverse of this would be true of species infesting spiders, for they would be required to kill more insects than if not infested.

It will be observed that in the foregoing classification nothing has been said of what are commonly known as "neutral" plants and "neutral" insects. Notwithstanding such statements as ¹"Birds destroy insects enormously, but these are in the great part neutral," it is doubtful if any such insects exist, at least when life is considered in its broadest relations to man. What noxious insect or plant have we which, when judged by the usual standard of neutrality, was not once neutral? Nineteen years ago the Colorado potato beetle, feeding in its original habitat upon a wild species of *Solanum*, would have been classed as neutral, and yet it only needed the encroachment of civilization upon its home to enable it to march eastward and take possession of the whole potato growing region of the United States, which it now holds with a tenacity that baffles all opposition. There are now feeding upon the potato beetle between twenty-five and thirty insects, all of which, until their possibilities of usefulness became known, would have been classed with the beetle upon which they prey as neutral. Now they are acknowledged friends, while the beetle is a pronounced enemy. All those insects which may feed upon plants under cultivation, or upon those which are yet to come under cultivation, are, with the utmost consideration for them, to be looked upon as but latent enemies, and guarded as such, while those animals which hold them in check should be looked upon as latent allies, to be held in reserve for future needs. But when vegetation not under cultivation, and not to be regarded as weeds, is considered with reference to its soil-producing function, to its influence upon climate, and to the production of lumber and fuel, the insects which feed upon it are injurious, and the birds and insects which hold them in check are beneficial. Viewed in this light, the life of the Rocky Mountains and that of the wilds of the British Possessions are as directly connected with human interests as the winds and the waters which flow from them. The food of birds cannot, therefore, be said to consist of insects which are, in the great part, neutral.

When it is proposed to utilize birds as insect destroyers, to increase the abundance of certain species and to exterminate or hold in check others, to encourage the breeding of certain birds in given places and to prevent others from doing so; or, when it is proposed to introduce into a country a foreign species, other questions than those of food simply must be considered.

Some of the more important of these are the following:

(1) *The relations which the bird holds to different industries.* The failure to recognize the dissimilar relations which various birds sustain to different indus-

¹ Nature's Means of Limiting the Number of Insects. *Am. Nat.*, Vol. VIII, p. 270.

tries has led to much of the diversity of opinion in regard to the value of birds as destroyers of insects, and to much of their needless persecution. The Bobolink, considered with reference to rice-culture, has been regarded as a scourge in the Carolinas, where almost countless numbers of them have been slaughtered. But all through the Northern States, where it spends the summer, and where it is almost exclusively insectivorous, few birds are more needed than it. Here it occupies the grassy meadows, both damp and dry, where grasshoppers, crickets, cutworms, and other noxious insects abound and upon which it may feed. To the dairying interests of its summer home, then — and these are by far the greater and more important — it is as beneficial as it is destructive to the rice-crops of the South. Shall we ask our Southern friends to guard their plantations and spare the birds? Before we can do this with consistency we must know more definitely than we do now what injury and service they render in the South, what work they do in the West Indies, whither they take themselves for the winter, and what is to be the mission of the large number that pass by us in summer to the fast opening Saskatchewan country to breed.

(2) *The food and habits of the bird in different localities.* That these elements must be taken into consideration is sufficiently evident from what has been said in regard to the Bobolink under the last head.

(3) *The food of the bird during different seasons.* There are very many of our birds which, if judged alone by their food during a particular season, would be classed as injurious, when in reality they are very beneficial. The Red-winged Blackbird during the month of August is, in many localities in Wisconsin, very injurious, and for this reason has often been declared a nuisance. It is, however, far from being such. During the months of May, June and July, its home is in the sloughs, wet meadows and low pastures, and from these it often visits the adjoining dry fields. In all of these places it feeds, like the Bobolink, very largely upon insects. After the corn has hardened in the fall, it is again beneficial, feeding almost exclusively upon insects and the seeds of weeds, which it obtains in cultivated fields.

(4) *The food of the bird when young and when mature.* We probably have no bird except the Carolina Dove, Passenger Pigeon, possibly the Thistle Bird, and perhaps some of the birds of prey, whose young are not largely or entirely fed upon insects. The first few weeks of a bird's life (during which time the majority of our species attain their full size) is the most voracious period of its existence. Dr. Bradley has estimated that a pair of Sparrows, with a brood to feed, will consume 3,360 caterpillars in the course of a week. A pair of Thrushes are said to have carried to their young, in the course of an hour, 100 insects, principally caterpillars. A young Robin, reared by Prof. Treadwell, required not less than sixty earth-worms a day. A Wood Pewee was observed by the writer to carry, to her brood of three, forty-one insects in three-fourths of an hour.

In view of these facts, it is evident that there can be but few of our birds, unless it be some of those which plunder the nests of other birds, which are not beneficial during one period of their existence at least.

(5) *When and how long the bird is with us.* The birds that are with us longest, other things being equal, are, of course, capable of rendering the greatest service or the greatest injury; and they are the birds, viewed from an economic standpoint, which should interest us most. But the service which birds of passage render is far from being so insignificant as to be overlooked. On the contrary, the services of these birds are so great that we have a right to demand their protection when they are in lands not our own.

The assertion,¹ "Birds are only united in troops more or less considerable at the times of migrations of autumn and spring, that is when insects are infinitely less numerous than during the summer"—however true the impression which it conveys may be for Europe, is wholly untrue for the United States both in reference to summer residents and to birds of passage. During an average of two weeks in the spring and for the same length of time in the fall, the birds of passage are probably double the number per square mile of our summer residents. They are with us then nearly one-fifth as long and in double the abundance, consequently they should do, if we leave out of the account the rearing of young, nearly two-fifths as much work. We should expect them to eat more, relatively, for they are working harder. Many of them have been flying all night and not quietly sleeping among the branches as resident birds do.

Because the insects are infinitely less numerous during the seasons when birds are migrating, does not signify that the actual number of insects destroyed is necessarily so much less. The hungry and exhausted birds must be fed before they can resume their journey, and if they do not find food in abundance they only search the more diligently and scrutinize the more closely until their wants are supplied. Although most of the insects upon which they feed in the fall have nearly or quite passed through the period of their destructiveness, yet many of them are the ones which are to hibernate in one state or another, and from which the next season's ravages are to come. Those which are consumed during the spring are the forms which have survived the severities of winter, and from which far more of destruction than is actually realized would come if they were left to multiply during the coming summer. It can hardly be said, then, that in the insects which they do destroy, they render a less service than do other birds. They supplement the work of our summer residents, as it were, at both extremities, and they do it well. Let us see to it that they are properly protected.

Some of our birds of passage are quite destructive to some crops in the fall. The Tennessee Warbler, called, by some, with us, the Grape-sucker, occasionally does serious injury to vineyards by probing with its sharp bill the ripe grapes, apparently to obtain the juice. It might be inferred that as this bird is with us so short a time, its services in destroying insects can hardly compensate for the injury which it may do to vineyards, and, consequently, that it is a fit subject for extermination. The very fact, however, that it is with us so short a time should make us all the more careful in regard to what steps are taken in respect to it. For, if ours is the only injury it does, and so far as is now known it is, it must lead a long life of usefulness in other places where it may do what other birds are not able to accomplish. It is, indeed, one of those small active species which feeds quite extensively upon plant-lice and other very small insects which are said to be overlooked by most birds. From the stomachs of four specimens examined collectively, thirty plant-lice, and thirty small heteropterous insects, nine-hundredths of an inch long, were taken.

(6) *The place in which the bird nests.* Wherever a bird builds its nest (except the forms whose young run about as soon as hatched), there or in the immediate vicinity, as a rule, its labors are confined until after the young are able to feed themselves. In consequence of this, those birds which breed in cultivated grounds and in the vicinity of dwellings are generally the most valuable. It should be observed, however, that cultivated grounds are not the only places where the insects which ravage them are bred. The army-worm

¹ Nature's Means of Limiting the Number of Insects. Am. Nat., Vol. VIII, p. 270.

has for its natural abode the wild grass swamps so common in many parts of the country, and from there, when it becomes excessively abundant, it marches out upon fields of grass and grain in such vast columns as to sweep everything green before it. The army-worm year of 1861 will long be remembered. The Rocky Mountain Locust is another insect of the same kind.

Viewed in the light of such facts as these, insectivorous birds which rear their young in such uninviting places, and where they appear to lead useless lives, shine with a new interest to us; and even though they may be somewhat destructive, they should be protected until careful study proves that they do not feed upon the army-worm or other pests. Some of the birds which frequent these situations are the Marsh and Short-billed Wrens, the Swamp Sparrow, several of the Blackbirds, the Bobolink, the Rails, as well as other birds.

The situation in which the nest is placed has much to do in determining the abundance of the species, especially in cultivated districts, and consequently its general usefulness. The Short-billed Wren often builds in our low, wet meadows, but its breeding season is not fully past when haying-time begins, and many a nest freighted with eggs or young is mown down and its contents destroyed. The result is, that it is far less abundant than its cousin, which selects more secure breeding places. The Short-billed Wren cannot, therefore, be offered as a substitute for the troublesome Redwing, or for the Bobolink, both of which breed in similar situations, but which get their young upon the wing before the grass is ready to cut.

Birds, like plants, may be out of place, and so more injurious than they would be if confined to their proper spheres. Blue Jays and Shrikes have no right in orchards and about dwellings during the breeding season, unless more useful birds cannot be induced to tarry there.

(7) *The haunts of the birds.* The places which a bird frequents during the season, though always including the place where it nests, are often much more varied and extensive. Upon these haunts, as upon the breeding places, depend much of the bird's usefulness or injury. All of our Thrushes, so far as food and method of obtaining it are concerned, have essentially the same habits as the Robin, but none of them are, at present, as useful to agricultural or horticultural interests as it is. Should any of them in the future become as familiar as the Robin, they will doubtless approximate it in usefulness.

(8) *The time of day at which the bird obtains its food.* Nocturnal insectivorous birds and those which feed in the early twilight are especially to be encouraged, not because they are necessarily more destructive to insects than other birds, but because they feed at a time when insects are abroad in abundance and when they have but comparatively few enemies with which to contend. Rapacious birds, however, which obtain their food at night are to be regarded with more suspicion, perhaps, than those which fly by day. All the Owls, provided with their peculiar plumage, are able to move so noiselessly, that, under the cover of night, when other birds are in repose, they may be expected to exert a powerful influence in reducing the abundance of birds, especially of the woodland species.

(9) *The method by which the bird obtains its food.*

(10) *The situation in which the bird obtains its food.*

(11) *Whether or not the bird does an important work which other birds are not fitted to do.*

These are questions of extreme importance, especially if it is proposed to extirpate a species, or to reduce its abundance. There is such a division of labor among birds, that, as has been said, there are very few insects indeed which may

not, in one or more stages of their existence, become a prey to them. And this division of labor which birds have assumed, in the face of the profusion of life from which they may choose their food, is conclusive evidence to me that the power which they exert over the abundance of insect life is far from being inappreciable. The utility of birds as a whole, judged by that of a particular species, without reference to the points under consideration, would undoubtedly lead to an unfavorable, but equally false conclusion. What we need to aim at in regulating the bird-fauna of agricultural districts, is to make it combine, in sufficient abundance, all of those species which do peculiar but important work. We need, in fact, to adopt those divisions of labor which nature has been so long in working out, and perhaps without modification, except so far as changing conditions and industries make it necessary that new relations should be established.

To expect the Robin, with an unlimited abundance, to do the work of the Kingbird and Pewee, or that these birds can do the work of the Vireos, is absurd. Neither can the slow-winged and short-flighted Pewee and Kingbird, although they are fly-catchers, be expected to do what the Swallows are able to accomplish with their long, swift, gyratory and zig-zag flights. Each species has fitted itself by long practice for its own peculiar work, and does it more effectually than another species can. Viewed in this light, it is evident that some birds, even though they may be somewhat destructive to particular crops, must, nevertheless, be protected, simply because they do an important work which other birds do not.

The Baltimore Oriole has been consigned to extirpation because it is somewhat destructive to grapes, destroying at times, it is said, more than it needs to eat; and yet this bird does an important work, which, so far as I have observed among birds, is peculiar to itself. It is that of feeding upon leaf-rollers in the larval state. These are a large and destructive group of moths. They infest nearly all our fruit trees, our strawberries and cranberries, as well as many of the trees of the forest. Those which do not infest the fruit protect themselves either by folding one side of a leaf over them, or by tying a number of leaves securely together, thus forming a strong house in which they feed secure, I fear, from the majority of birds. But the Oriole has learned their habits, and, with its strong bill, is able to demolish their houses and devour the inmates. I have seen a whole family of these birds working together in a grove devouring leaf-rollers, and making such a noise as to lead me to suspect at first that some large animal was stripping the leaves from the trees. Prof. J. H. Comstock informs me that he has seen the same bird thrust its head through the web of the tent-caterpillar, and eat the larvæ which courted security within.

When a bird which is injurious does a special work, that work must be an important one in order that it may be urged as a reason for protecting the bird. The tent-caterpillar, although it is very destructive, is easily and completely under our direct control. Its tent makes it so conspicuous that it cannot be overlooked, while every worm in a colony may be easily removed at once and destroyed. When it is said that this evil sometimes becomes so great that even the best farmers have despaired of counteracting it, the statement only speaks disparagingly of the energy and shrewdness of the farmers. It is not in the destruction of such pests as these that birds render their greatest service, but rather in the destruction of those that are small, though prolific, of those that do not betray their existence until after their hurtful mission is performed, and of those that feed singly and do not congregate under tents for a season of rest and security.

(12) *Size and activity of the bird.* The larger and the more active a bird is the greater will be the amount of food which it requires, and, consequently, other things being equal, the more beneficial, or the more injurious, it will be. It is by no means, however, the largest bird which is the most serviceable. Diminutive proportions are, in many cases, quite as desirable as their opposites. It is the smallness of the Tennessee Warbler which makes it profitable for it to feed upon plant lice; and it is the same quality, together with its agility, that enables the Chickadee to hang back downwards from the leaves of the outermost sprays of trees, that it may feed upon those small larvæ and other insects which can only be obtained by the larger and more clumsy species with difficulty. These small and agile birds perform, therefore, a distinct work in protecting the terminal foliage of forest trees.

(13) *Whether the bird is or is not gregarious in its habits.* It is not necessary that birds should be "united in troops more or less considerable" that they may be of material service. On the contrary, insectivorous birds can hardly be gregarious, at least to any considerable extent, for feeding purposes, while it is the gregarious habits of many graminivorous birds which lends to them their chief noxious quality. Not that they would eat any less grain if they did not unite in such large troops, but that their injury would be more evenly distributed, causing each man to bear his share of the expenses incident to bird life, as he has received his share of the profits. Did our Blackbirds spread out over the country at large instead of uniting in such large troops, the amount of grain which they would consume, though just as great as it is at present, would be drawn from so many sources that the quantity taken from each would be so small as to be almost inappreciable. Birds having gregarious habits, unless they perform some special and important work, should not be encouraged to an equal extent with other birds; and this point should be looked to especially, when it is proposed to introduce a foreign species.

(14) *The swiftness and dexterity of the bird upon the wing.* The swifter and the more dextrous an insectivorous bird is, which captures prey upon the wing, the more efficient it is, provided other things are equal. If it feeds extensively upon parasitic insects, it becomes more dangerous, as it is better able to capture its prey. Among rapacious birds the swiftest winged Hawks are to be looked upon as the most dangerous; and, if any of these birds are to be extirpated, those which are best able to capture mature birds should succumb first. Extreme swiftness of flight is not necessarily possessed by those Hawks which are to hold in check injurious mammals.

(15) *The disposition of the bird.* When different species of birds are to be associated closely together, as is the case in many cities, and as we hope will be more extensively the case in orchards, and in the vicinity of dwellings, only those, as a rule, which will live together in harmony should be encouraged. At least, a tyrannical, overbearing bird should not be permitted to drive away from our dwellings more useful species.

(16) *The value of the bird as food for man.* Birds whose size and flesh make them valuable as food for man have that much in their favor to offset whatever injury they may do. But birds may be too valuable as insect-destroyers to justify their being killed as game. The Prairie Chicken and Quail should be stricken from our list of game birds, at least for the present, and the Meadow-lark, Killdeer, and Field Plover should not be destroyed under any consideration, until after they assume an abundance far beyond what they have with us at present. The last three species are almost exclusively insectivorous throughout their stay with us, and they affect meadows, pastures, and cornfields where

their services are much needed. The Quail and Prairie Chicken are also largely insectivorous until after the middle of August, when the grain is harvested and out of danger from them, and as they live in uncultivated fields and meadows their services are very valuable.

(17) *Whether the bird is or is not a necessary habitat for troublesome parasitic entozoa.* As many fishes are infested with parasites, some of which pass through one stage of their development in Herons and other piscivorous birds, it becomes a question worthy of study to determine whether these birds may become detrimental to fish-culture by breeding parasites which will destroy the fish or render their flesh unfit for food. This question is the more important since fish-culture has become a national enterprise.

(18) *The number of broods the bird rears each season.* Those birds which rear more than one brood during the season, if they are not injurious, are likely to be of greater service than those which are single-brooded, not only because they must be more destructive to insects directly, but because they are capable of becoming more numerous than single-brooded species are likely to become.

OTHER CONSIDERATIONS.

(1) *The changing habits of birds.* Two hundred years have been sufficient to produce such marked changes in the habits of many American birds as to have caused them to assume entirely new relations to human interests. In virtue of these changes many birds have become more useful, some have become more injurious. Many, like the Swallows, now build their nests in situations whose surroundings are so entirely different from those of their original haunts that the character of their food must have undergone quite as marked a change as have the situations in which they build their nests. Since all of our native birds, which are so familiar about dwellings and farms, once inhabited exclusively wild tracts, it is but fair to presume that many which are now shy and retiring will in time become as confiding as those which have already taken up their homes with us. Indeed, these changes are being noted almost every year. When these changes of habits do take place, with them must come new and important relations. Some of these birds will then be more useful, others may be more injurious. The practical question arising from this is, how can we best hasten these changes?

(2) *Can birds ever become abundant in thickly settled districts?* The facts which have thus far been recorded in regard to the abundance of different species of birds in different localities at different times, are so meager and indefinite, that it is impossible to draw any very satisfactory conclusions in regard to this point at present. To throw some light upon this question the statistics on page 447 have been prepared. They are too limited to be of very great value by themselves, and are offered here simply as a beginning. The two localities in which the statistics were taken are not as similar in some respects as could have been wished. Due allowance must be made for this fact. The salient features of the two localities, briefly sketched, are these: In the vicinity of Ithaca, there is a long, deep and narrow valley, having somewhat rolling, glen-cut sides. In it lies Cayuga lake, deep and weedless, stretching, like a broad river, to the northward. Its east and west banks are abrupt and rocky and cut at intervals by deep, wooded glens. A small grass swamp, bearing a few trees, at the south end of the lake, and running up into the city is about the only low land in the vicinity. Formerly a mixed deciduous and evergreen forest covered the hills. Now, mere remnants stand near together upon small, close-packed farms on both sides of the valley. The houses are numerous, the orchards large,

and there are few fields but what have at least a few trees standing in them. In the portion of Jefferson county where the notes were taken, the country is nearly level, with gentle undulations, and is traversed by Rock and Bark rivers. These streams draw a sharp line between prairie and openings on one side, and heavy maple timber on the other. Marshes trend along the streams, and shallow, reedy ponds are common. Compared with the vicinity of Ithaca, the farms are larger, the houses less numerous, the orchards smaller, the woods larger, and few trees stand in the cultivated fields.

Route I led from a point about one-half a mile north from Bark river out and across cultivated fields, through two small groves, across a marsh near Cold-spring Pond, and then again across cultivated fields. Routes II and III each led east from Rock river, north of Jefferson, alternately through pieces of heavy timber, and across dry cultivated fields. Route IV led from the Crawfish west, upon the prairie southwest of Aztalan, traversing dry treeless fields, and leading through two small oak groves. Route V extended from the buildings of Cornell University west across the valley, leading through a pasture, through the north end of the city, through the swamp, and up the railroad, bordered by cultivated fields on one side and by tangled thickets on the other. Route VI led directly east from the campus to Varna, and then southwest along the line of the railroad. On this trip only cultivated fields were crossed and one small piece of woods passed through. Route VII led up the valley from Ithaca along the east side, and then across to Enfield Falls. On this tramp we passed in turn along the railroad, bordered with small scattered thickets on both sides, across the Inlet, through low fields, and then past cultivated fields and small pieces of woods. Route VIII lay ten miles east of Ithaca, and led from McLean off to the southeast of Dryden, and then through Dryden to Freeville. A branch of Fall Creek was crossed twice, and with the exception of a small marsh near Freeville, only dry cultivated fields and small pieces of woods were passed.

It should be observed that the notes taken in Jefferson county were obtained after the breeding season, while those taken at Ithaca were made during the breeding season before the young birds had, to any extent, left the nests. The difference in the times of observation in the two localities will doubtless compensate largely for the difference in topographical features. For instance, the Bobolinks observed on trip VIII were, with two exceptions, all males, so that the figures probably show but about one-half the actual number of birds of this species which were there at the time.

The table, as it stands, indicates that notwithstanding the fact that the vicinity of Ithaca has been much longer under cultivation, and that it is more thickly settled, its bird population is more than a third larger, so far as the number of individuals is concerned, than that of Jefferson county. Whether this greater abundance is due more to the influence of man than to natural topographical features, the table does not appear to prove, for it is deceptive in regard to this point in several respects.

(3) *What birds, if left to themselves, are likely to become most abundant as the country grows older.* Before we can safely interfere with the restraints which nature has imposed upon bird-life, we must know the facts in regard to this point, because it can hardly be supposed that the different species will continue to hold the same relative proportions to one another that they now do if their enemies should be removed. If the birds in the table to which we have had occasion to refer are classified under the four heads, Fruit-eaters, Fly-catchers, Seed-eaters and Insect-eaters, the average number of individuals observed per mile during the eight trips, considered collectively, will be found to be approximately as follows:

FRUIT-EATERS.

For the vicinity of Ithaca.

Number of species observed.....	3
Number of individuals observed	179
Average number per mile.....	7+

For Jefferson county.

Number of species observed	3
Number of individuals observed	37
Average number per mile.....	3—

SEED-EATERS.

For the vicinity of Ithaca.

Number of species observed.....	16
Number of individuals observed	576
Average number per mile.....	23+

For Jefferson county.

Number of species observed	12
Number of individuals observed	141
Average number per mile.....	9+

FLY-CATCHERS.

For the vicinity of Ithaca.

Number of species observed	10
Number of individuals observed	255
Average number per mile.....	10+

For Jefferson county.

Number of species observed	8
Number of individuals observed	106
Average number per mile.....	7+

INSECT-EATERS.

For the vicinity of Ithaca.

Number of species observed	8
Number of individuals observed	69
Average number per mile.....	3—

For Jefferson county.

Number of species observed	14
Number of individuals observed	116
Average number per mile	8—

These figures appear to indicate that the greatest difference between the two localities exists among the Fruit-eaters, the Seed-eaters, and the Insect-eaters, the first two classes being much more abundant at Ithaca, while the Insect-eaters are much more abundant in Jefferson county. Much less weight can be given to these figures than to those considered under the last head. They simply indicate a direction in which observation needs to be made.

(4) *Some birds may be injurious to a locality which they seldom or never visit.* The migratory movements which characterize most birds subject them to a great variety of enemies. The boreal birds of prey, which live in the summer homes of all our birds of passage, and of all our winter visitants, are as injurious to us, so far as they destroy the members of these classes, as though they did the work of destruction in our midst. The same is to be said of those

birds of prey whose residence is in latitudes south of our own, for there both our summer residents and birds of passage may be destroyed by them.

(5) *Do birds of prey perform a necessary work by holding in check certain birds and noxious animals?* "Hawks and the larger Owls should be exterminated" is the verdict of many, and yet we are far from having that knowledge of their relations to our needs which will justify the execution of such a verdict. We need a greater abundance of insectivorous birds than we have at present, but it has not been demonstrated that a wholesale destruction of all our birds of prey will not withdraw such a restraint from our vegetable-feeding species as to cause them all to become nuisances by their excessive abundance. Nearly all of them feed upon seeds or insects, at their pleasure. There are but few of them which are not known to feed to some extent upon grains and useful seeds. These facts appear to indicate that no bird is so likely to become excessively abundant in agricultural districts as they. It would appear that, so far as they are capable of doing the work of insectivorous birds, they might even become injurious by simply crowding them out. Until these questions are securely settled, we must retain most of our birds of prey. We may experiment with them by reducing their abundance for a period, and carefully noting the effect which it has upon the abundance of other birds and upon that of noxious mammals. Since a bird once extirpated can never be reclaimed, no matter how much its services may be needed, the most guarded action in this direction can alone be justifiable.

(6) *Parasitism among birds.* Birds which possess the habit of imposing their duties of incubation upon other species are to be ranked with Hawks and Owls, so far as their influence in regulating the abundance of birds is concerned. Out of nine Pewees' nests, which were visited in the spring of 1878, at Ithaca, N. Y., by my friend F. H. Severance and myself, two contained a single Cowbird each, and two contained Cowbirds' eggs. Mr. C. N. Pennock informs me that three out of five Pewees' nests visited by him contained one or two Cowbirds' eggs each. These facts indicate that seven out of fourteen families of Pewees would, if their nests had not been disturbed, have had their own broods destroyed, and that instead of some 28 or 35 Pewees which they would have reared, only seven Cowbirds could have taken their places as insect destroyers. Such is the influence which this bird exerts over the abundance of the Pewee.

A long list of other birds, similarly affected, has been determined, and the majority of the members are among the most exclusively insectivorous birds we have.

(7) *The scientific, educational and æsthetic value of birds.* This, though mentioned last, is not the least consideration which should challenge the thoughtful and influential whenever a bird is proposed for extermination. Prof. Alfred Newton, in an article on the extermination of species (*Am. Jour. of Sci.*, Dec., 1876), has pointed out, in a general way, the dangerous tendencies in this direction, and justly calls upon men of science to take a stand in behalf of posterity.

In view of the many important unsolved problems relating to life and its phenomena, the first factors of whose solution we already have, it is certain that the living species are too few to supply the much needed data, and that stuffed skins and dry bones can, in no adequate way, answer such questions as should be put to animated tissues. These, in my judgment, are sufficient reasons for not now recommending the absolute extirpation of any bird.

In the light of educational needs, the case of the detrimental bird appears still stronger. It is certain that, as our methods of instruction improve, the

student will be led more and more into intimate personal contact with the forms of living, feeling and thinking nature to supplement and vivify, with his own perceptive faculties, the suggestions from teacher and text-book. The amount of illustrative material needed in the shape of living forms must increase year by year as long as our educational methods are progressive; while, with the most careful husbanding of resources, the number of living species must diminish in given localities. The time has already come when the least beneficial animals should be sacrificed for anatomical and physiological demonstrations, whenever they will answer the purpose, and the more beneficial forms, in other ways, spared. Here are grounds for a legitimate demand for the preservation of animals to some extent detrimental, and every parent can well afford to contribute a not inconsiderable sum for their maintenance as educational material simply.

There is another aspect of the educational phase of this question. The amount of information unconsciously imbibed by the inevitable contact with living forms is very large as regards both variety and value, and this must increase continually as long as there is progress, and the objects for personal contact remain. Viewed in this light, the very viciousness of the Blue Jay and Shrike gives to them a kind of intrinsic educational value which is not small.

A TEMPORARY CLASSIFICATION OF WISCONSIN BIRDS ON AN ECONOMIC BASIS.

In view of the fact that so little careful study has been devoted to the food of American birds, and that the subject, considered in all its important bearings, is so difficult, intricate and important, it is deemed advisable, for present purposes, to arrange our birds under the groups following. In this classification, only Wisconsin interests will be especially considered, not because the interests of other states are regarded as unimportant, but because each state, so far as its industries are peculiar, must solve its own questions.

GROUP I.

Birds whose habits, so far as they are known, render them, on the whole, beneficial.

Under this group are placed those birds whose ability to render service appears to exceed their known injurious tendencies. It may be divided into three classes:

(a) *Birds whose known habits render them beneficial at all times.*

While it is probable that, after a careful and exhaustive study of the habits of our birds has been made, none of them will be found wholly beneficial, it is better to regard them innocent until they are proved guilty.

(b) *Birds which are known to be to some extent injurious, but whose known services exceed their known injuries.*

It is probable that all of our useful birds will ultimately fall into this class.

(c) *Birds whose flesh is valuable for food, and whose present abundance and slight usefulness as insect destroyers make it proper to permit their destruction as game.*

Birds of this class belong properly in one of the two preceding classes, but this classification is made for an obvious special purpose.

GROUP II.

Birds whose habits, so far as they are known, make it doubtful whether they are, on the whole, beneficial or injurious.

This group is necessitated partly by conflicting evidence, partly by the absence of evidence, and partly by evidence which seems to indicate that the destructiveness and usefulness of the birds are nearly balanced. As in the first group, this may be divided into three classes:

(a) *Birds whose relations of structure and habits ally them to Group I, but which in the absence of data, or on account of conflicting data, cannot be placed there at present.*

(b) *Birds whose known beneficial and injurious results appear to balance.*

(c) *Birds whose relations of structure ally them to Group III, but which in the absence of data, or on account of conflicting statements, cannot be placed there at present.*

GROUP III.

Birds whose habits, so far as they are known, render them, on the whole, injurious.

In this group are placed those birds whose ability to do injury appears to exceed their beneficial agencies. It is divisible into two classes:

(a) *Birds whose known habits render them injurious at all times.*

As in the first class of Group I, it is probable that, ultimately, the members of this class will all be placed in the next.

(b) *Birds which are known to be to some extent beneficial, but whose known injuries exceed their known services.*

How shall a bird's food account be expressed numerically in terms of debit and credit? This is at once the most difficult and the most important of all the questions requiring solution in order to express the *specific* economic relations of any bird.

Nothing can be more certain than that, after the food of a bird has been classified under the heads "Elements Beneficial" and "Elements Detrimental" to man, neither the relative volumes nor the relative weights of these two classes of materials can express the true economic relations of the bird.

If we compare the corn plant-louse, the gall stage of the grape phylloxera, the plum-curculio, the small parasitic military microgaster, which lays its eggs in several kinds of cut worms, the potato-beetle and the chinch-bug, with the large coral-winged grasshopper, bulk for bulk, the ratios will appear about as follows:

1 coral-winged grasshopper = 12,000 military microgasters.

1 coral-winged grasshopper = 3,000 phylloxera.

1 coral-winged grasshopper = 1,500 corn plant-lice.

1 coral-winged grasshopper = 750 chinch bugs.

1 coral-winged grasshopper = 60 plum curculios.

1 coral-winged grasshopper = 7 potato-beetles.

1 coral-winged grasshopper = 1,000 young potato-beetles.

By a system of gauging bulk for bulk, it is evident from the table that one coral-winged grasshopper eaten by a bird would give it a credit which would offset completely the destruction of 12,000 military microgasters, a proposition sufficiently absurd. The same system of gauging would also count the destruction of seven adult Colorado potato-beetles as the full equivalent of 1,000 very

young beetles of the same species, while, as a matter of fact, the destruction of seven very young beetles should be counted a greater service than the destruction of an equal number of adult forms, since not only is the food required to mature the young beetles saved, but the possibility of a deposition of seven thousand eggs (it is estimated that one female may lay one thousand eggs), is effectually precluded.

The fragmentary condition, also, of the contents of a bird's stomach renders any purely quantitative system of gauging as fruitful of false values as does the inequality of size and weight among insects. A single maxilla, a bit of elytron, or a small wing would count for almost nothing in the account by such a system, while each is positive proof of the destruction of a whole insect of some kind, no matter how small the fragment may be.

But when insects are estimated bulk for bulk with grains, weed seeds and fruits, the diversion from true relations reaches the maximum.

A peck of plums and a peck of curculios, a peck of wheat and a peck of chinch-bugs, or a peck of corn and a peck of cut-worms, are manifestly not to be considered as equivalent values on opposite sides of any account.

Even in those cases where the individuals are nearly equal in bulk and weight, there is often little justice in offsetting one with the other, for then no account will be taken of the relative service or injury of the two species, or of the different rates of reproduction.

In view of the fact that we have no standard of insect values, and that, in the present state of progress of entomological science, a satisfactory one can hardly be furnished, the simplest and, I believe, all things considered, the most reliable method of exhibiting the results of observations on the food of birds, as well as one which will leave the materials accumulated in the most available form for subsequent more critical examination, is to exhibit the number of individual forms of life which a bird can be proved to have eaten in as systematic a form and as specifically as possible. In the tables which follow under the various families of birds, an effort has been made to do this. The second table in each case exhibits the details as far as they could be shown in the space allowed, and the first table exhibits the same facts brought together under the heads "Elements Beneficial," "Elements Detrimental," and "Elements whose Economic Relations are Unknown." There are two general tables introducing the body of the report which exhibit the same results for all of the birds examined, brought together under the families to which they belong.

Tabular summary of the results of an examination of the contents of the stomachs of 1,608 birds.

THE NAMES OF THE FAMILIES TO WHICH THE BIRDS EXAMINED BELONG.	Whole number of birds examined.															
	Number eating animal food.	Number eating vegetable food.	Number eating adult forms.	Number of adult forms eaten.	Number eating pupæ.	Number of pupæ eaten.	Number eating larval forms.	Number of larval forms eaten.	Number eating eggs.	Number of eggs eaten.	Number eating beneficial forms.	Number of beneficial forms eaten.	Number eating noxious forms.	Number of noxious forms eaten.	Number eating forms of unknown economic relations.	Number of forms of unknown economic relations eaten.
Thrushes	105	93	46	66	159	2	6	34	73	3	15	12	18	46	96	67
Bluebirds	27	26	1	24	40	...	...	6	9	2	10	3	5	20	42	11
Sylvias	16	16	...	14	65	1	1	3	9	...	...	...	3	9	14	64
Pitmice	12	12	1	12	42	...	...	7	14	1	5	2	2	8	17	10
Nuthatches	29	27	10	26	87	1	1	2	4	...	...	...	2	5	10	27
Creepers	3	2	...	2	6	...	...	...	...	...	...	...	...	...	...	6
Wrens	27	27	2	27	108	...	...	5	9	1	5	2	2	13	23	20
Larks	6	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...
Wagtails	2	2	...	2	6	...	...	...	...	...	...	...	...	...	...	6
American Warblers	246	241	19	218	1,118	1	1	60	184	6	133	14	28	72	323	218
Tanagers	29	29	4	27	120	1	1	8	26	...	...	7	15	10	38	25
Swallows	32	32	...	32	281	...	...	...	...	...	...	13	67	16	124	17
Waxwings	15	5	13	5	18	...	...	...	1	50	2	2	7	2	7	3
Greenlets	87	85	14	62	301	1	1	47	114	7	88	7	9	61	113	51
Shrikes	15	15	...	15	75	...	...	4	6	...	...	7	8	13	49	10
Finches	339	156	266	102	484	...	...	35	67	5	16	13	18	62	241	110
American Starlings	150	74	99	56	194	...	...	19	71	4	65	9	12	37	119	50
Crows, Jays, etc.	35	28	28	23	51	...	...	8	11	...	...	2	5	10	15	22
American Flycatchers	119	119	5	118	659	...	...	11	23	5	328	32	53	41	126	113
Goatsuckers	7	7	...	7	118	...	...	...	1	162	1	1	4	18	7	97
Chimney Swifts	3	1	...	1	2	...	...	...	...	...	...	...	...	...	1	2
Humming-Birds	5	5	...	5	17	...	...	...	...	...	4	4	1	1	5	12
Kingfishers	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cuckoos	14	14	...	11	62	...	...	11	83	...	3	3	12	102	4	31
Woodpeckers	110	102	41	84	1,864	8	285	30	166	...	6	22	41	354	87	1903
Owls	8	3	1	2	9	...	...	1	10	...	...	...	3	19	...	...
Hawks	15	13	...	12	102	...	...	2	3	...	3	3	8	60	2	10
Pigeons	16	2	16	2	26	...	...	1	2	...	1	1	1	15	2	12
Grouse	8	5	5	4	13	...	...	2	25	1	5	1	7	30	...	...
Plover	16	16	...	14	78	...	...	7	15	1	52	2	7	9	33	13
Phalaropes	5	4	...	4	16	...	...	3	10	...	...	...	...	...	4	20
Snipe, etc.	45	38	5	23	150	...	...	7	13	...	5	17	3	6	35	164
Hérons	15	15	...	11	39	...	...	4	21	...	8	47	1	1	7	53
Rails	16	9	14	3	12	...	...	...	...	...	...	...	1	2	9	58
Ducks	13	7	9	1	2	...	...	1	3	...	1	2	...	...	6	69
Gulls	6	6	...	5	28	...	...	3	6	...	...	...	3	6	5	26
Grebes	6	6	...	5	24	...	...	2	15	...	...	...	2	15	5	32
Totals .	1,608	1,243	605	1,021	6,376	15	296	323	991	38	934	164	367	515	2,018	964

Tabular summary of the results of an examination of the contents of the stomachs of 1,608 birds.

	Number of hymenoptera eaten.	Number eating hymenoptera.	Number of lepidoptera eaten.	Number eating lepidoptera.	Number of diptera eaten.	Number eating diptera.	Number of hemiptera eaten.	Number eating hemiptera.	Number of coleoptera eaten.	Number eating coleoptera.	Number of orthoptera eaten.	Number eating orthoptera.	Number of neuroptera eaten.	Number eating neuroptera.	Number of spiders eaten.	Number eating spiders.	Number of myriapods eaten.	Number eating myriapods.
Thrushes.....	73	34	45	24	1	1	2	2	93	44	22	13	...	...	5	5	1	1
Bluebirds.....	2	1	10	6	...	...	1	1	13	8	22	17	...	...	2	2	...	...
Sylvias.....	2	2	9	3	12	2	...	...	14	6	...	...	...	...	1	1	...	...
Titmice.....	...	...	10	5	...	...	3	1	13	7	...	...	...	...	2	2	...	...
Nuthatches.....	5	2	6	3	4	2	...	...	47	17	...	...	...	...	1	1	...	...
Creepers.....	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wrens.....	4	2	14	10	7	3	7	2	33	10	3	3	2	2	...	...	...	...
American Warblers.....	45	23	167	55	175	59	79	15	221	80	6	4	10	7	4	3	...	...
Tanagers.....	4	4	26	8	6	3	6	3	47	17	7	4	1	1	11	3	...	...
Swallows.....	21	9	16	9	57	11	44	7	85	19	2	2	40	10	1	1	...	...
Waxwings.....	5	1	...	...	4	1	...	...	3	2	3	1	3	1	...	...	...	...
Greenlets.....	21	5	114	48	26	8	76	10	56	26	10	9	5	4	2	2	...	...
Shrikes.....	...	...	12	4	2	...	...	...	18	9	24	7	6	3	...	...	...	...
Finches.....	10	7	67	25	11	7	138	12	96	41	28	23	4	3	4	4	1	1
American Starlings.....	2	2	79	26	15	6	2	1	80	30	42	22	2	2	...	...	...	...
Crows, Jays.....	1	1	3	3	...	...	...	...	30	15	8	5	...	...	...	...	...	...
American Flycatchers.....	97	26	48	24	114	28	9	7	48	24	18	13	29	21	...	...	...	...
Goatsuckers.....	...	...	13	3	...	...	23	2	33	5	5	1	4	2	...	...	...	...
Chimney Swift.....	...	...	...	...	2	1	...	...	...	...	...	...	...	...	...	...	...	...
Humming-birds.....	1	1	...	...	...	...	1	1	...	...	...	...	...	...	3	3	...	...
Cuckoos.....	13	2	77	10	...	...	...	...	10	2	26	6	...	...	2	2	...	...
Woodpeckers.....	1449	61	24	12	2	2	222	5	215	48	2	2	...	...	2	2	...	...
Owls.....	...	...	10	1	...	...	...	...	...	6	1	...	...	...	...	...	...	...
Hawks.....	...	...	7	2	...	...	...	...	...	3	11	...	...	...	...	...	...	...
Pigeons.....	...	...	2	1	...	...	...	...	...	13	1	...	...	...	1	1	...	...
Grouse.....	...	...	24	2	...	...	...	...	5	3	3	2	...	...	1	1	...	...
Plover.....	15	4	9	5	1	1	...	...	32	11	13	7	...	...	3	1	...	...
Phalaropes.....	...	...	...	...	...	...	...	...	6	3	...	...	...	...	...	...	...	...
Snipe, etc.....	6	1	1	1	3	3	...	...	45	14	5	3	3	2	...	...	...	...
Hérons.....	...	...	...	...	...	...	32	4	11	4	...	...	26	4	1	1	...	...
Rails.....	...	...	...	...	...	...	5	2	2	2	...	...	...	...	...	...	...	...
Ducks.....	...	...	...	...	...	...	6	3	...	...	...	...	2	1	...	...	...	...
Gulls.....	...	...	...	...	...	...	6	3	...	...	...	...	6	3	...	...	...	...
Grebes.....	...	...	...	...	...	...	15	4	...	...	...	...	15	2	...	...	...	...
Grand Totals.....	1,779	189	793	290	444	140	671	82	1,262	430	337	157	158	68	52	35	2	2

FIG. 103.

**TYPES OF THE PRINCIPAL GROUPS OF BENEFICIAL AND
DETRIMENTAL ANIMALS PREYED UPON BY BIRDS.**

*(Beneficial.)***MAMMALS.***(Detrimental.)*

Those preying upon night-flying insects;—
Bats. Those eating terrestrial and underground
insects;—Shrews and Moles.

Those eating grains, birds or their eggs;
Rats, Mice, Gophers and Squirrels.



HOARY BAT.



POCKET GOPHER.



COMMON MOLE. THOMPSON'S SHREW.



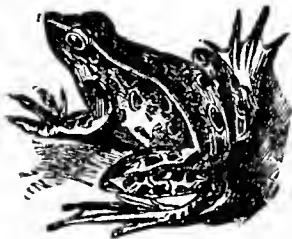
WHITE-FOOTED MOUSE.

BATRACHIANS. *(Beneficial.)*

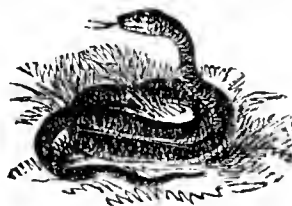
Those preying upon detrimental insects;—
Toads, Tree-Toads. Frogs and Salamanders.

SNAKES. *(Detrimental.)*

Large ones preying upon frogs, toads, birds
and their eggs;—most snakes over 18 or 20
inches long.



LEOPARD FROG.



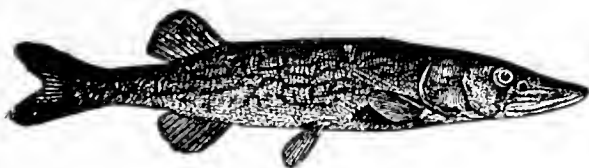
BLACK SNAKE.

FISHES. *(Beneficial.)*

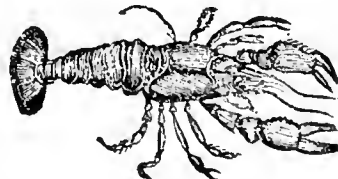
Those suitable for food or for the food of
food-fishes.

CRUSTACEANS. *(Detrimental.)*

Those building clay chimneys in meadows. (??)



PICKEREL.



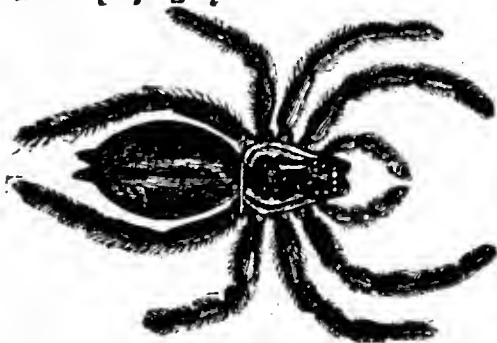
CRAY-FISH.

SPIDERS. *(Beneficial.)*

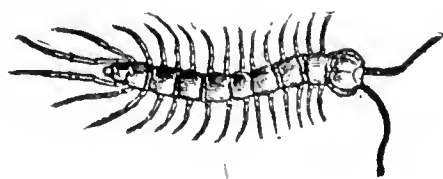
Those preying upon detrimental insects.

MYRIAPODS. *(Beneficial.)*

Those preying upon detrimental insects.



SPIDER.



AMERICAN EARWIG.

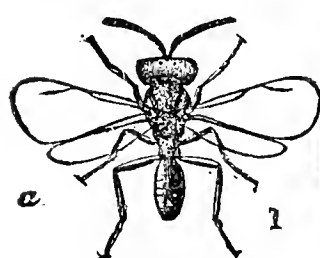
FIG. 104.

TYPES OF THE PRINCIPAL GROUPS OF BENEFICIAL AND DETRIMENTAL ANIMALS PREYED UPON BY BIRDS.

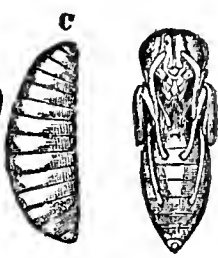
(Beneficial.) **HYMENOPTERA.** (Detrimental.)

Those that are parasitic or predaceous on
noxious insects;—Ichneumon and Chalcis
Flies, Egg-Parasites and Solitary Wasps.

Those eating leaves, boring stems, or pro-
ducing galls;—“Slugs,” Saw-Flies, Horntails,
and Gall-Flies.



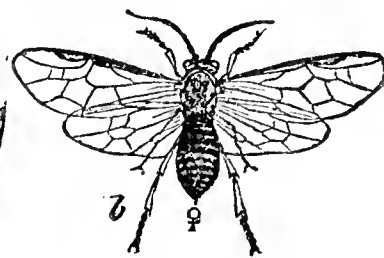
CHALCIS FLY.



LARVE. PUPA.



LARVE.

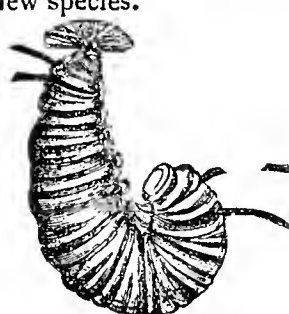


CURRANT SAW-FLY

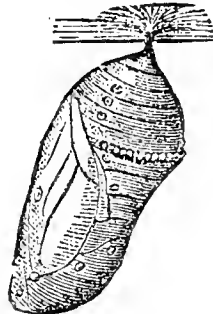
(Beneficial.) **LEPIDOPTERA.** (Detrimental.)

Those feeding on weeds;—comparatively
few species.

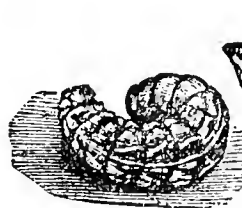
Those feeding on useful plants;—Butter-
flies, Moths, Cut-worms, Measure-worms, Leaf-
rollers, etc.



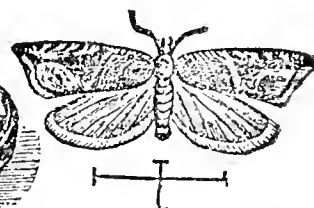
MILKWEED CATERPILLAR..



PUPA.



W-MARKED CUT-WORM.

STRAWBERRY
LEAF-ROLLER

(Beneficial.) **DIPTERA.** (Detrimental.)

Those preying upon detrimental insects and
carion;—Asilus, Syrphian and Meat-Flies.

Those feeding on useful plants and ani-
mals;—Gnats, Gall-Gnats, Crane- and
Horse-Flies.



ASILUS FLY.



SYRPHUS FLY.



SHEEP BOT-FLY.



(Beneficial.) **COLEOPTERA.** (Detrimental.)

Those preying upon detrimental insects and
carion;—Lady-Birds, Tiger- Ground- Car-
rion- and Rove-Beetles.

Those feeding on useful plants;—Click
Long-horned, Lamellicorn, and Leaf-Beetles
Grubs. Wire worms, Wood-borers and Weevils.



TIGER BEETLE.



LARVE.



APPLE TREE BORER.



LARVE.

FIG. 105.

TYPES OF THE PRINCIPAL GROUPS OF BENEFICIAL AND DETRIMENTAL ANIMALS PREYED UPON BY BIRDS.

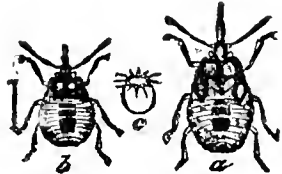
*(Beneficial.)***HEMIPTERA.***(Detrimental.)*

Those sucking the blood of detrimental insects;—Reduvian and some Coreid Bugs.

Those sucking the juice of useful plants;—Harvest-Flies, Leaf-Hoppers, Plant-Lice, Chinch-Bugs, etc.



SPINED SOLDIER-BUG.



EGG AND LARVE.



PLANT LOUSE.



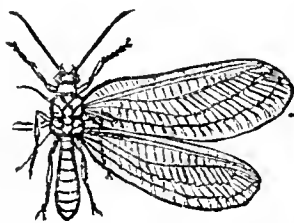
SQUASH BUG.

NEUROPTERA. *(Beneficial.)*

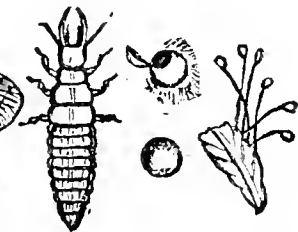
Those preying upon detrimental insects;—Dragon-Flies, Lace-Wings, and Ant-Lions.

ORTHOPTERA. *(Detrimental.)*

Those feeding on useful plants;—Grasshoppers, Locusts, Crickets, Cockroaches.



LACE-WING FLY.



LARVE. COCOON EGGS.



GRASSHOPPER. LARVE AND EGGS

FAMILY TURDIDÆ: THRUSHES.

FIG. 106.

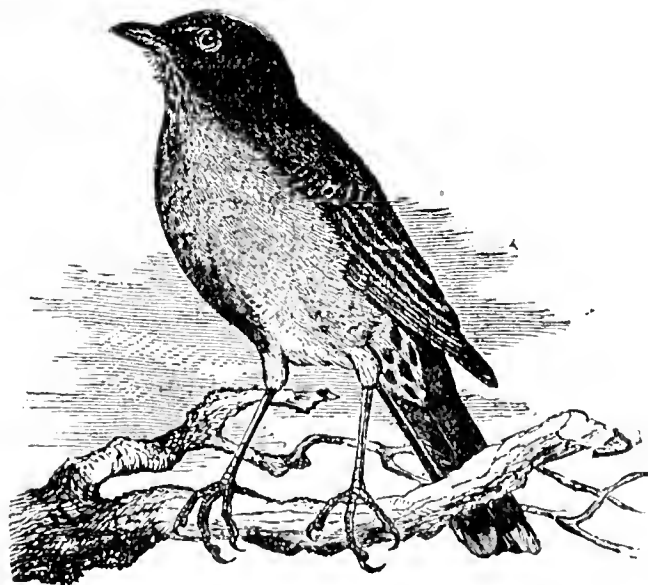
COMMON ROBIN (*Turdus migratorius*). From Baird, Ridgway and Brewer.

Table showing the number of birds which had eaten (1) vegetal and (2) animal food, and the economic character of the latter (mostly insects) under the heads Beneficial, Detrimental and Unknown Relations.
































NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of thirty-seven Robins examined	34	Contained	Animal food..	
	13		Vegetal food .	
	29		60 Detrimental..	
	6		10 Beneficial	
	17		56 Unknown.....	
Of two Wood Thrushes examined	2	Contained	Animal food..	
	1		Vegetal food .	
			Detrimental..	
	2		4 Beneficial	
Of nine Hermit Thrushes examined .	9	Contained	Animal food..	
	3		Vegetal food .	
	5		7 Detrimental..	
	9		28 Unknown.....	
Of eighteen Olive-backed Thrushes examined	16	Contained	Animal food..	
	6		Vegetal food .	
	4		10 Detrimental..	
	1		1 Beneficial	
	13		26 Unknown.....	
Of seven Wilson's Thrushes examined.	5	Contained	Animal food..	
	3		Vegetal food .	
	2		4 Detrimental..	
	2		2 Beneficial	
	4		10 Unknown.....	
Of twenty-two Cat-birds examined	17	Contained	Animal food..	
	13		Vegetal food .	
	3		8 Detrimental..	
	2		2 Beneficial	
	15		28 Unknown.....	
Of ten Brown Thrushes examined	10	Contained	Animal food..	
	7		Vegetal food .	
	8		7 Detrimental..	
	1		3 Beneficial	
	7		11 Unknown.....	

Table showing the kind and amount of animal, mostly insect, food eaten by the Thrushes.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirty-seven Robins examined	3	Contained	14	Hymenoptera	
	13		26	Lepidoptera..	
	19		53	Beetles	
	6		9	Grasshoppers.	
	2		2	Spiders	
	1		1	Millepede	
	2		2	Angle-worms.	
	24		67	Adult forms..	
	2		6	Pupæ.....	
Of two Wood Thrushes examined	1	Contained	2	Ants.....	
	1		1	Caterpillar ...	
	2		2	Beetles	
	2		4	Adult forms..	
	1		1	Larva	
Of nine Hermit Thrushes examined.....	1	Contained	20	Ants.....	
	6		6	Beetles	
	3		3	Caterpillars ..	
	2		3	Grasshoppers.	
	6		26	Adult forms..	
	3		4	Larvæ.....	
Of eighteen Olive-backed Thrushes examined.....	4	Contained	11	Ants.....	
	4		10	Lepidoptera..	
	5		9	Beetles	
	1		1	Plant-louse ..	
	1		1	Spider	
	13		24	Adult forms..	
	4		10	Larvæ	
Of seven Wilson's Thrushes examined.	1	Contained	2	Ants.....	
	4		9	Beetles	
	1		1	Harvest-man .	
	4		7	Adult forms..	
	1		4	Larvæ.....	

Table showing the kinds and amount of animal, mostly insect, food eaten by the Thrushes — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-two Catbirds examined	6	Contained	24	Ants.....	<div></div>
	1		1	Caterpillar ...	<div></div>
	1		1	Tipulid	<div></div>
	3		3	Beetles	<div></div>
	1		1	Heteroptera..	<div></div>
	3		6	Orthoptera ...	<div></div>
	1		1	Spider	<div></div>
	10		15	Adult forms..	<div></div>
Of ten Brown Thrushes examined	3	Contained	3	Larvæ	<div></div>
	2		4	Lepidotera...	<div></div>
	5		11	Beetles	<div></div>
	2		4	Orthoptera ...	<div></div>
	2		2	Snails	<div></div>
	7		16	Adult forms.	<div></div>
	3		3	Larvæ.....	<div></div>

1. TURDUS MIGRATORIUS, LINN. COMMON ROBIN. GROUP I. CLASS b.

The Robin is the largest and the most abundant of the Thrushes, as it is the most confiding and familiar. With us, it frequents, by preference, agricultural districts, and is especially attracted to towns and villages and to the suburbs, parks and cemeteries of large cities. Not less than a hundred pairs of Robins reared their young, in 1878, within the city limits of Ithaca, N. Y.

In its method of obtaining food, and in the situation from which its food is gleaned, the Robin performs a very important work, and one for which few other birds are so well adapted. So important is this work that the quantity of small fruits which it consumes is but a stingy compensation for the services which it renders, and I know of no bird whose greater abundance is likely to prove of more service to the country. Its eminently terrestrial habits, its fondness for larvæ of various kinds, and its ability to obtain those which are hidden beneath the turf, give it a usefulness in destroying cut-worms, in the larval state, which no other bird possesses in the same degree, and for this feature of its economy alone its greater abundance should be encouraged.

Early in the morning and towards the close of the evening, the Robin may often be seen searching after cut-worms in lawns, pastures and meadows, and when thus engaged, it hops about apparently gazing more at distant objects than searching for something near at hand; then, suddenly, it commences tearing up the old grass and turf with its bill; and, in another instant, it stands triumphant with its wriggling prize in its bill, for it rarely digs in vain. I have seen a Robin capture, in this manner, five cut-worms in less than ten minutes; and five other birds, within view, were doing the same work.

Almost invariably the larvæ were beaten upon the ground and more or less mangled before they were eaten; and by taking advantage of the Robin when she lays her prey upon the ground, by throwing something at her she can usually be driven away and whatever she has captured obtained. How the Robin discovers these cut-worms is not easily explained. It is possible, however, that the larvæ while gnawing at the bases and roots of the grass stems, while secreting themselves after their night's raids, or while, toward evening, they grow restless and hungry, the slight movements which they produce among the grass are sufficient to betray their hiding places to the Robin. It should be observed in regard to these cut-worms, that large numbers of them are destroyed by various birds just after showers and during cool, drizzly and lowery days, when the absence of the scorching rays of the sun enables them to feed with quite as much comfort as during the night. Facts like these should weigh heavily against such *a priori* reasoning in regard to the general utility of birds, as "many (insects) are nocturnal and hide by day, with that instinct of self-preservation which is as much developed in them as in larger animals." It may be added here, that possibly the greater activity which birds evince at the approach of and during stormy weather may find a partial explanation in a corresponding activity of insect-life, which would enable them sooner to obtain a meal.

While the Robin obtains a greater part of its food upon the ground, it does not reject those insects which it meets while passing among the branches of trees and shrubbery; and its ability to discover these insects is quite remarkable. I have seen it throw itself from the boughs of an oak tree into a grape vine standing three rods distant, and, without stopping, seize and bear to the ground a hog-caterpillar-of-the-vine which had attained about two-thirds its full size. The expedition with which this capture was made convinced me that the Robin must have marked its prey before it left the tree, and that, after all, "mimicry" of colors does not furnish that protection to insects against birds which appears to be supposed.

All are familiar with the situations in which the Robin builds her nest, and in this connection it need only be added that it is always located out of the way, where nothing but wilful hands and marauding cats are likely to disturb it. The two or three broods of from three to five individuals each indicate how destructive to insects it must be, and how abundant it may become if properly protected and encouraged. It is generally amicable in its relations with other birds, and allows those whose haunts are similar, but whose work is different, to associate with it. Should this species become excessively abundant, it may be easily reduced without resorting to fire-arms — instruments whose murderous use has made them terrifying to birds of all kinds, — for their nests are easily discovered and reached.

The results obtained from an examination of thirty-seven stomachs of the Robin are indicated, in a general way, in the two tables introducing the family. Of these specimens one was taken in March, one in April, eleven in June, thirteen in July, five in August, six in September and one in October.

Five birds had eaten eleven cut-worms; three, five wire-worms (Elaters); five, six grub-worms; two, two caterpillars (Arctians); one, a hog-caterpillar-of-the-vine (*Choerocampa pampinatrix*); five, eight scarabeans; two, two curculios (*Breviostres*); one, a click-beetle (Elater); one, an ichneumon-fly (*Anomalon*?); two, two spiders; one, a millepede; two, two angle-worms; six, nine grasshoppers; two, eight grasshopper eggs; one, a moth; three (young birds), pellets of grass; one, choke cherries; two, black cherries; one, raspberries; one, grapes one, sheep berries; and one, berries of Indian turnip.

From the stomach of one Robin were taken seven cut-worms, 1.25 inches long, six other caterpillars, varying from three-fourths to one inch long, two small curculios and five grape seeds.

From the stomachs of three young Robins — all of the same brood — were taken respectively, (1) one wire-worm, one grub-worm, one caterpillar, several beetles, and a pellet of grass; (2) one wire-worm, three larvæ, one ground beetle, one lamellicorn beetle, and a small pellet of grass; (3) one grub-worm, one caterpillar, several small seeds and a pellet of grass.

The food of the Robin, as indicated by others, is as follows:

“Its principal food is berries, worms and caterpillars; berries, those of the sour gum and poke berry” (Wils.); “Chiefly insects — especially worms — and berries” (Cooper); “Worms, insects, berries, and fruits” (De Kay); “Grubs and caterpillars, crickets, grasshoppers, grubs of locusts, harvest-flies, and of beetles, the apple-worm when it leaves the apple, cut-worms, silk-worms” (Samuels); “Larvæ of Bibionidæ” (Packard); “Larvæ of *Dryocampa senatoria*” (A. J. Cook). Prof. S. A. Forbes concludes, from an examination of the contents of 41 stomachs, that 78 per cent. of the food was insects; 2 per cent. myriapods and spiders, and 28 per cent. grubs. Twelve per cent. were caterpillars, 7 per cent. beneficial beetles (Harpalinæ), 6½ per cent. noxious beetles, 8 per cent. orthoptera and 1½ per cent. noxious myriapods. This record, he concludes, indicates fully as much injury as good done by these forty-one birds.

2. *TURDUS MUSTELINUS*, GM. WOOD THRUSH. GROUP I. CLASS b.

This rich-voiced songster, though a summer resident, is far from being common at present, even during the migrations. Its favorite haunts are the osier and alder thickets which embrace the winding streams of our low, deep woods, but during the fall and spring, more open woods and groves are visited by it. Like the Robin it is terrestrial in its habits, and appears to obtain its food in a similar manner; but its secluded retreats forbid any direct relation to agricultural interests at present. There are indications, however, that its habits are changing, and that it is becoming more familiar.

In the Germantown (Pa.) Telegraph for May 8, 1878,¹ occurs the following from the pen of its editor:

“But within the last five years it (Wood Thrush) has appeared in our gardens, builds its nest and rears its young. Last year they had considerably increased upon our premises, notwithstanding much of the cover had been cut away; and already this season they have made their appearance quite numerous and have begun to entertain us with their charming song. They have also become quite tame, fully as much so as the Robin or Catbird. This, too, in the very face of our colony of House Sparrows.” If these are facts, by due encouragement and protection we may hope to have the Wood Thrush much more abundant and familiar than it now is.

Of two specimens examined, one had eaten two ants, fragments of beetles, and one caterpillar; the other had eaten fruits and beetles.

Its food, according to Wilson, consists of lichens, berries, caterpillars and beetles. Audubon states that it eats berries, small fruits, and occasionally insects and various lichens.

Prof. S. A. Forbes says of the contents of the stomachs of twenty-two birds which he examined, that “seventy-one per cent. of their food consisted of in-

¹ From an article clipped from a Boston paper and kindly sent me by Dr. Brewer.

sects and twenty per cent. of fruit, a small ratio of spiders and an unusually large percentage of myriapoda making up the remainder. Blackberries, strawberries, cherries and gooseberries appear among the fruits. The twelve per cent. of myriapoda were mostly *Palydesmus* and *Inulus*. Harvest-men were among the two per cent. of arachnida, orthoptera were six and hemiptera one per cent. Wire-worms and snout-beetles make up thirteen per cent. and the carabidæ amount to six per cent. The coleoptera make eighteen per cent. and the diptera twelve per cent. Lepidoptera were taken in about the same amount, one-third being recognized as cut-worms, while ants reached the unusual average of fifteen per cent.

3. *TURDUS UNALASCÆ NANUS* (AUD.), COUES. **EASTERN HERMIT THRUSH.**
GROUP I. CLASS b.

The Hermit Thrush, occasionally at least, occurs in our state during the summer, where I believe it also breeds, although it is regarded by Dr. Coues, "on the whole, a more northern bird than any of its allies." Two specimens of this species were obtained July 22, 1876, near Waupaca. Both were males. The first was perched near the top of a dead tree standing in a small opening in an unfrequented piece of upland woods, and singing merrily when taken. Four other birds similarly situated in the immediate vicinity, and just as joyous, hushed their voices and fled when their comrade fell; the other was surprised on the shore of a small lake in the edge of a grove of young tamaracks. During the fall migrations of this species, which begin the last of September, it is common in timbered districts where pieces of woods are bordered by open fields. In the spring nearly all have passed us to the northward by the 10th of May. Nelson states that this, and the two varieties of the Olive-backed Thrush, frequent vacant lots and grounds containing shrubbery in Chicago, in large numbers during the migrations—a fact which bespeaks for them a growing familiarity. As with all of the Thrushes, it obtains most of its food from the ground. Of nine specimens examined, one had eaten twenty ants; three, a caterpillar each; two, three grasshoppers; six, as many undetermined beetles; and one, a wire-worm. One had eaten wild grapes, and one, berries of the Indian turnip.

Of eighteen specimens examined by Prof. Forbes, thirteen per cent. of their food was ants, eighteen per cent. lepidoptera, twelve per cent. carabidæ (including *Dischirius globulosus*, *Platynus*, *Evarthrus*, *Pterostichus*, *Amara*, *Anisodactylus*, *Bradycellus* and *Stenolophus*), five per cent. dung-beetles, two per cent. curculios, two per cent. plant beetles, nine per cent. hemiptera (including three per cent. Reduviidæ), eighteen per cent. grasshoppers, and a single lace-wing. A few of the caterpillars were measuring-worms. Eighty-seven per cent. of the food was insects proper, four per cent. arachnida and nine per cent. herbivorous myriapods.

4. *TURDUS USTULATUS ALICLÆ* (BD.), COUES. **ALICE'S THRUSH; GRAY-CHEEKED THRUSH.**

5. *TURDUS USTULATUS SWAINSONI* (CAB.), COUES. **OLIVE-BACKED THRUSH.**
GROUP I. CLASS b.

Considering both varieties of *Swainsoni* together, this Thrush, aside from the Robin, is the most abundant member of its genus. Neither form, so far as known, nests in the state; Nelson, however, mentions var. *Swainsoni* as a rare

summer resident in Northern Illinois. The fall migration occurs earlier than that of the last species, and I have taken both varieties on the same day — September 1st; from this time until the end of the month it is abundant. During their stay, the greater number spend their time in groves of small trees, but woods bordered by fields are also visited by them, and occasionally they glean along fence-rows. Rarely one enters an orchard for a taste of grapes.

Of eighteen specimens examined, three had eaten seven caterpillars; five, nine beetles; four, eleven ants; one, four moths; one, an aphid; one, a spider, and one the grub of a carab beetle. One had eaten wild grapes, one black cherries, and one berries of Indian turnip.

From the stomach of one specimen were taken four ants, four small moths, one aphid, one spider, and six eggs of some insect, apparently those of some moth, and probably from one of the moths which the bird had eaten. Birds are often mentioned as destroying the eggs of insects; in my own observations, however, I have never found eggs in the stomach of any bird which did not appear most likely to have come from a fecundated insect which the bird had eaten, and it is my opinion that birds rarely make a practice of hunting insect eggs.

Prof. Forbes found eight stomachs of the variety Alice's Thrush, taken in May, to contain seven per cent. of mollusks, forty-two per cent. (of every bird) ants, thirteen per cent. of caterpillars, eight per cent. of crane flies and two per cent. of predaceous beetles. One had filled itself with scavenger beetles. All had eaten small curculios amounting to two per cent.

The stomachs of six specimens of Swainson's Thrush, one taken in April and five in May, contained twenty-two per cent. crane flies, twenty-eight per cent. ants, five per cent. predaceous beetles (*Harpalidæ*), several curculios, and in one stomach was found a mass of short-horned borers, *Scolytus muticus*, Say.

6. *TURDUS FUSCESCENS*, STEPH. VEERY; TAWNY THRUSH; WILSON'S THRUSH. GROUP I. CLASS b.

The Veery, though a summer resident, is common with us only during its migrations. Its haunts are among the shrubbery of low deep woods, where it is oftener heard than seen. Like the Wood Thrush it is apparently becoming reconciled to man, and is beginning to assume more familiar relationships with him. In the immediate vicinity of Ithaca, N. Y., it is one of the commonest birds. In the cemetery, and in the glens of Cascadilla and Fall Creeks — both of them are close by the campus and are visited by students every day, — all through the spring its subdued song has been one of the most attractive features of those beautiful scenes. The breeding habits of this Thrush are not such, at present, as to ensure it a very great abundance in agricultural sections of the usual topography, for it builds upon or close to the ground, where it is more likely to be disturbed unintentionally and where situations suited to its present tastes are rare. Mr. F. H. Severance found a nest of this species placed in a little opening near the banks of Fall Creek, upon a small bunch of flood-grass, and only hidden by the tall grass which grew around the spot. He simply looked into the nest, without touching it, and came away; but when, two days afterwards, we visited the nest together, we found that the suspicious pair had forsaken it. Such facts as this show how cautiously we must deal with these timid birds, if we wish to retain their services in any but their secluded retreats. Nuttall mentions an instance of a pair of these birds breeding in a garden near Boston. At Ithaca, I have seen them passing from the fields back to glens and

thickets which adjoin them, and I have no doubt that they had been searching for food.

Of eight specimens examined one had eaten two ants; one, a large lamellicorn beetle; one, three wire-worms (*Elatér*); one, a larve of a ground beetle; one, a harvest-man; two, dogwood berries; and one, raspberries.

Insects (Samuels). Beetles, berries, and, in Labrador, blossoms of several dwarf plants (Aud.). Canker-worm (Maynard).

7. *MIMUS POLYGLOTTUS* (L.), BOIE. **MOCKINGBIRD.** GROUP II. CLASS a.

This is a southern species which occurs irregularly in the state, and is said to nest occasionally near Racine.

8. *MIMUS CAROLINENSIS* (LINN.), GRAY. **CATBIRD.** GROUP II. CLASS b.

Known to almost everybody, looked upon by children as a peevish, snarling bird, and regarded by the farmer and gardener as a sly, sneaking robber, the poor Catbird has but few friends. Although not one of the best birds, he renders a far greater service and does much less injury than many give him credit for. Extremely abundant in his favorite resorts, with us the whole summer, of good size and active habits, his aggregate consumption of food is large. Loving best willow, osier, and alder thickets, where woods slope into marshes, the brush piles and brambles about old clearings, the hazel patches fringing groves, and the tangled hedges that often grow along fences, the Catbird can do but little harm while in these haunts. On the contrary, he must render there material service, for such places are the nurseries of hosts of insect forms. It is only when he intrudes upon orchards, gardens and vineyards for small fruits that he can be looked upon as injurious; this, however, he rarely does unless his favorite haunts are near at hand. Occasionally he nests in those gardens where much shrubbery grows along the fences, and his familiar feline "mew" is sometimes heard in our villages.

Of twenty-two specimens examined, six had eaten twenty-four ants; two, three grasshoppers; one, three crickets; three, three beetles; one, sheep berries; two, dogwood berries; one, blueberries; one, choke cherries; one, raspberries, and one, black cherries. From the stomach of one bird were taken three crickets and two grasshoppers, and from that of another were taken one ground beetle (*Harpalini* ?), one tipulid, one heteropterous insect and one larva (caterpillar?). Its food, according to others, consists of strawberries, cherries and pears (Wils.); insects, worms, fruits and berries (Cooper); berries, worms, wasps and other insects (De Kay); canker worms (Maynard). Prof. Forbes, in discussing the economic relations of the Catbird, after having examined the contents of seventy stomachs, concludes that the beneficial, injurious and neutral elements eaten by the birds stand in the relation of 41 to 15 to 44. Among injurious insects he finds the birds had eaten saw-flies one per cent., lepidoptera seven, leaf-chafers two, snout-beetles one, plant-beetles one, chinch-bugs one, and orthoptera three, making a total of sixteen per cent.; while among beneficial insects he finds predaceous beetles five per cent., predaceous hemiptera one, and arachnida two, making a total of eight per cent. Deducting the eight per cent. of beneficial insects from the forty-one per cent., it is seen that thirty-three per cent. of the food consisted of garden fruits, while fifty-two per cent. represents the amount of fruits of all kinds eaten by the birds.

9. *HARPORHYNCHUS RUFUS* (LINN.), CAB. **BROWN THRUSH; SANDY MOCKINGBIRD; THRASHER.** GROUP I. CLASS b.

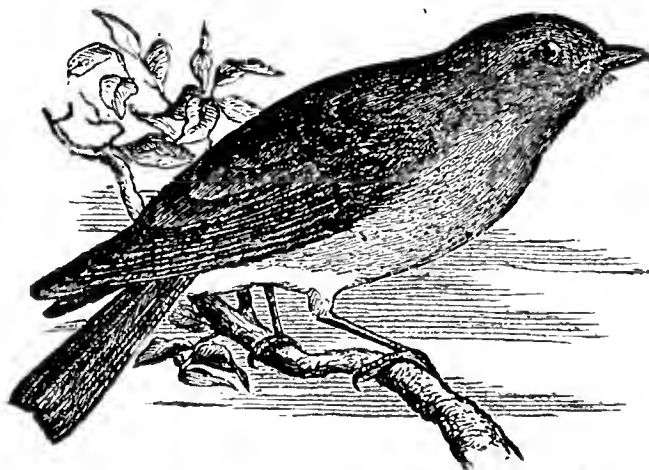
Although a common and familiar bird, the Thrasher is not as abundant as the last species. Its haunts, too, are similar, but it prefers to choose them in opening and prairie sections rather than in heavy timbered districts, where the Cat-bird exists in greater abundance. In proportion to its numbers, it also makes more frequent visits to the vicinity of dwellings. The Brown Thrasher is eminently terrestrial in its habits, and obtains much of its food beneath the fallen leaves and mould of its favorite haunts, and for this work the strong decurved beak serves its owner admirably.

Of ten specimens examined, one had eaten two crickets; one, two grasshoppers; five, eleven beetles — among which were two species of *Harpalus*; three, three larvæ — among them caterpillars and a grub of a tiger beetle; two, two mollusks; five, seeds; one, wheat; and one, wild grapes.

“Its food consists of worms, which it scratches from the ground, particularly a dirty-colored grub more pernicious to corn than nine-tenths of the birds, ‘wasps’ and beetles. It is accused of scratching up corn” (Wils.). “It eats insects, worms, berries of all sorts, ripe pears, and figs” (Aud.). “Worms, insects and various kinds of berries” (De Kay). Prof. Forbes has examined the contents of the stomachs of sixty-four of these birds, and estimates the beneficial, noxious and neutral elements to stand in the relation of 33 to 26 to 41. Among the injurious insects eaten were seven per cent. lepidoptera, ten leaf-chafers, two spring-beetles, two snout-beetles, one chinch-bugs and four orthoptera; while among the beneficial insects were six per cent. carabidæ, two predaceous hemiptera, one spider and one of predaceous thousand-legs. From this it is seen that twenty-six per cent. of the insects eaten were injurious and ten per cent. beneficial, including the spiders and myriapods. Twenty-one per cent. of the food consisted of small fruits.

FAMILY **SAXICOLIDÆ**: STONECHATS AND BLUEBIRDS.

FIG. 107.



EASTERN BLUEBIRD (*Sialia sialis*). From Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.












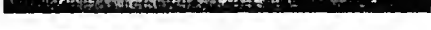


NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-seven Bluebirds examined.....	26	Contained		Animal food.....	
	1			Vegetal food	
	20		42	Detrimental	
	3		5	Beneficial	
	11		22	Unknown.....	

Table showing the kinds and number of insects and spiders eaten by the Bluebird.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-seven Bluebirds examined.....	1	Contained	2	Ants.....	
	6		10	Lepidoptera.....	
	8		13	Beetles	
	1		1	Heteroptera.....	
	17		22	Orthoptera	
	2		2	Spiders	
	24		40	Adult forms.....	
	6		9	Larvæ.....	
	2		10	Grasshopper eggs.	

10. SIALIA SIALIS (LINN.), HALD. EASTERN BLUEBIRD. GROUP I. CLASS b.

The Bluebird has so many excellent qualities that it promises to become, under proper management, one of the most readily utilizable insect-destroyers which we have among birds. It is, with us, almost exclusively insectivorous, and is especially destructive to grasshoppers. It captures its prey upon the wing and upon the ground, giving it a wide range of food, from which it may be expected to maintain, under favorable conditions, a steady and considerable abundance. Its long summer residence, its rearing of two, sometimes three, broods each season, its fondness for cultivated fields, and its willingness to breed in bird-houses protected from the ordinary enemies of birds, and beyond the disturbance of the machinery and live-stock of the farm, are other qualifications which tend to place it in the front rank of usefulness.

How to cause this bird to take and maintain a greater abundance than it now has is a question of great practical importance to all classes of farming. The fact that its familiar and confiding nature has not made it more numerous among us, appears to be readily explained by its breeding habits. In its unmodified condition, its nest is usually placed in some hollow limb or tree; and as a natural

consequence the Bluebird is driven away when its nesting places are destroyed. But as Bluebirds accept so gladly the houses which are sometimes provided for them, I can see no reason why, if sufficient and suitable breeding places were put up, they might not in a few years become far more numerous than they are now; and I would earnestly recommend that our farmers generally should put up cheap bird-houses, or even small boxes provided with suitable openings, in convenient places about their premises. Not one, simply, but several. Let them be put up in the trees which stand out in the fields and along the fences, so that the birds may be induced to live where their services are most needed.

Of the twenty-seven birds examined, one had eaten two ants; two, three moths; four, seven caterpillars; one, two tiger beetles; one, a ground-beetle; sixteen, twenty-one grasshoppers; one, one cricket; and two, a spider each. One bird ate a few raspberries.

Others record its food as follows: Principally insects, among which are large beetles and spiders. In the fall, berries of sour gum; in the winter, those of red cedar (Wils.). Numerous insects, among these, grasshoppers (Samuels). Beetles, caterpillars, spiders; in autumn, grasshoppers and various kinds of ripe fruits (Aud.). Multitudes of noxious insects; in autumn, cedar berries and wild cherries (De Kay).

Prof. Forbes, after examining one hundred and eight stomachs of the Bluebird, finds them to contain, among noxious insects, twenty-six per cent. lepidoptera; three per cent. leaf-chafers, and twenty-one per cent. orthoptera, making a total of fifty per cent.; and among beneficial insects, three per cent. ichneumons; carabidæ, seven per cent.; soldier-beetles, one per cent.; soldier-bugs, three per cent., and spiders, eight per cent.—making a total of twenty-two per cent. Seventy-eight per cent. consisted of insects, eight per cent. of spiders, and one per cent. of myriapods, making, with thirteen per cent. of vegetable food, the whole amount.

NOTE.—*Sialia arctica*, Arctic Bluebird. A single specimen of this species is said to have been observed in a collection at Dubuque, Iowa, which was taken late in the fall, upon the east side of the Mississippi river, near that place. (Birds of Northeastern Illinois, p. 95, by E. W. Nelson.)

FAMILY SYLVIIDÆ: SYLVIAS.

FIG. 108.



GOLDEN-CRESTED KINGLET (*Regulus satrapa*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations, showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of seven Ruby-crowned Kinglets examined.	7	Contained		Animal food	<div></div>
				Vegetal food	
	2		2	Beneficial	<div></div>
	2		4	Detrimental.	<div></div>
	6		24	Unknown.....	<div></div>
Of nine Golden-crowned Kinglets examined.....	9	Contained		Animal food.....	<div></div>
				Vegetal food	
	1		5	Detrimental	<div></div>
	8		40	Unknown.....	<div></div>

Table showing the kinds and number of insects and spiders eaten by the Kinglets.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of seven Ruby-crowned Kinglets examined.....	2	Contained	2	Hymenoptera ..	<div></div>
	2		4	Caterpillars	<div></div>
	3		5	Beetles	<div></div>
	1		1	Spider.	<div></div>
	6		26	Adult forms.....	<div></div>
	2		4	Caterpillars	<div></div>
Of nine Golden-crowned Kinglets examined.....	1	Contained	5	Caterpillars	<div></div>
	2		12	Diptera... ..	<div></div>
	3		9	Beetles	<div></div>
	8		39	Adult forms.....	<div></div>
	1		1	Pupa	<div></div>
	1		5	Larvæ.	<div></div>

Our representatives of this family are among the pigmies of the forest, and feed upon insects of proportionate size. From the stomach of a Ruby-crowned Kinglet were taken a chalcis-fly .08 of an inch, and two beetles only .07 of an inch long. In their method of obtaining food, they combine with the habits of the Fly-catchers, those of the Nuthatches and Warblers; but while they frequent similar haunts and feed upon the same grounds as the birds whose habits they imitate, their diminutive size and great agility enable them to perform a *special*

work by feeding more extensively upon the smaller insects. How destructive they may be to parasitic insects cannot be said at present. That their whole make-up fits them for such work, and that they do occasionally destroy them, is certain, but that they feed as extensively upon these insects as upon other forms is far from probable.

11. *REGULUS CALENDULA* (LINN.), LICHT. **RUBY-CROWNED KINGLET.**

GROUP I. CLASS b.

Of our two Kinglets, *Satrapa* is perhaps the most abundant. Both are migrants, and during their journeyings through the settled districts, they tarry in orchards, among the village shade-trees, in groves, in thickets bordering marshes and streams, and occasionally in more open woods.

Of seven specimens examined, two had eaten four small caterpillars; three, five beetles; one, an ant; one, a chalcis-fly, and two, bits of insects not identified.

According to others, its food embraces maple blossoms, pear, apple, and other fruit-tree blossoms—particularly the stamens. In November, it feeds upon numerous black-winged insects which infest orchards (Wils.). Insects, chiefly gnats and other *diptera* (Cooper). Seeds, insects and their larvæ (De Kay). Minute flying insects, their eggs and larvæ (Samuels). A single specimen examined by Prof. Forbes gave indications of a taste for lepidoptera, scarabæidæ, lady-bugs, heteroptera and spiders. I believe that Wilson was mistaken in regard to this species eating blossoms. It was probably catching insects among them.

12. *REGULUS SATRAPA*, LICHT. **GOLDEN-CRESTED KINGLET.** GROUP I.

CLASS a.

This species passes us earlier in the spring and returns later in the fall than the last. The 15th of October, 1877, it was abundant in the heavy timber along the Flambeau river. Of nine specimens examined two had eaten twelve small *diptera*; three, nine small beetles; one, five caterpillars; one, a small chrysalid, and three, very small bits of insects, too fine to be identified.

According to others their food embraces larvæ, various kinds of small flies, and a small black-winged insect which infests orchards (Wils.). Insects, which it takes upon the wing and from the crevices of the bark on trees (De Kay).

13. *POLIOPTILA CÆRULEA* (LINN.), SCL. **BLUE-GRAY GNAT-CATCHER.**

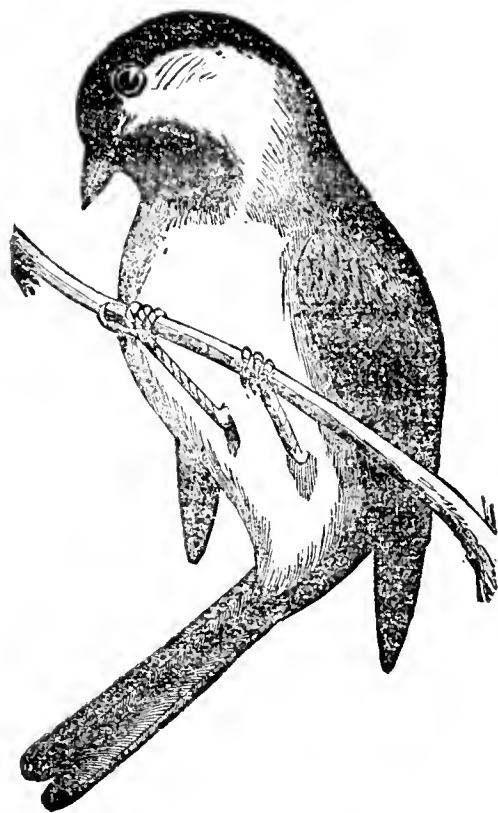
GROUP II. CLASS a.

This species is said to be not uncommon in Wisconsin and to breed in the state; Mr. Trippe mentions its occurrence in Iowa but not in Minnesota; and Mr. Nelson states that it is a common migrant in Northeastern Illinois. I have, however, never met with it. Indeed, it appears to prefer on the whole more southern latitudes than ours. Audubon says: it prefers the skirts of woods along damp, swampy places, and the borders of creeks and pools to the interior of forests.

Food: Winged insects, particularly mosquitoes (De Kay). Seizes insects on the wing (Aud.).

FAMILY PARIDÆ: TITMICE.

FIG. 109.



BLACK-CAPPED CHICKADEE (*Parus atricapillus*). After Coues.

Tabular Summary of Eeonomie Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to eeonomie relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of twelve Black-capped Chickadees examined...	12	Contained	Animal food.....	<div></div>
	1		Vegetal food	<div></div>
	2		2 Beneficial	<div></div>
	8		17 Detrimental	<div></div>
	10		37 Unknown.....	<div></div>

Table showing the kinds and number of insects and spiders eaten by the Black-capped Chickadee.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of twelve Black-capped Chickadees examined...	5	Contained	10 Caterpillars	<div></div>
	7		13 Beetles	<div></div>
	1		3 Heteroptera.....	<div></div>
	2		2 Spiders.....	<div></div>
	12		42 Adult forms	<div></div>
	7		14 Larvæ	<div></div>
	1		5 Insect eggs	<div></div>

14. *PARUS ATRICAPILLUS*, LINN. **BLACK-CAPPED CHICKADEE; TIT-MOUSE.** GROUP I. CLASS b.

The Titmouse, with its sympathy-enlisting "chick-a-dee-dee," is one of our abundant, hardy residents and most useful little foresters. During the breeding season it is principally confined to larch and pine tracts; but at other times it searches for food wherever trees may be found—along fences, in orchards, about dwellings and among village shade-trees, as well as in groves and woodlands. At Ithaca, N. Y., it has been a frequent visitor to the University campus all through the spring and summer. Its small size, its method of feeding, and its great agility enable it to perform a very useful and special work. In feeding it searches most diligently among the outermost branches of the trees, where it often hangs back downward from the leaves to obtain those small larvæ and insects which are accessible only with difficulty to larger and more clumsy birds. The habit which it has of picking open buds for insects which they often contain has led some to infer that it is injurious. Whatever injury it may do in this manner must certainly be trifling when compared with the service it renders. If the Chickadee is as destructive to insect eggs as it is said to be, its winter residence and its searching habits must lend great additional value to its services. Evidently if this bird could be induced to so change its breeding habits as to nest commonly in orchards and about dwellings, it would become one of the most valuable aids in destroying noxious insects. It does not appear improbable, in view of the fact that these birds build in sheltered situations, even though usually excavated by themselves, that they might not come, in time, to nest in houses like Bluebirds and Wrens, if they were properly encouraged to do so. Could such change be induced, we might then bring them readily into closer relationship with us; for they are already becoming familiar in cultivated districts out of the breeding season. I believe that an experiment worthy of thorough trial in this connection would be to put up in their breeding haunts some sort of cheap houses, perhaps imitating interiorly their own excavations, to ascertain whether it is not possible to induce them to nest in such places. If such a change could be brought about, first in their breeding haunts, we might then expect to bring them about our dwellings. No very marked immediate results could be expected from such a course; but future prosperity is not the last consideration with which we should deal.

Of twelve specimens examined, seven had eaten fourteen larvæ, ten of which were caterpillars; seven, thirteen beetles; two, two spiders; one, three heteropterous insects related to the genus *Tingis*; and one, five eggs of some insect. One individual of the twelve had in its stomach a few seeds.

Food according to others: Pine seeds, sunflower seeds, insects and their larvæ (Wils.). Nuts, numerous insects and their larvæ (De Kay). Eggs of the moth of the destructive leaf-rolling caterpillar and of the apple-tree moth and canker-worm; larvæ which infest buds, caterpillars, flies and grubs (Samuels). Though omnivorous, they prefer insects to all other food. Destroys the chrysalis of the woolly-bear, *Leucarcia aceræa* (Brewer). Insects,—their larvæ and eggs—berries, fruit, acorns, seeds of pine and sunflower, and poke-berries (Aud.). Canker-worms (Maynard). Caterpillars and plant-lice (Forbes).

15. *PARUS HUDSONICUS*, FORST. **HUDSON'S BAY TITMOUSE.** GROUP II. CLASS a.

This species is introduced in this connection on the authority of Dr. Hoy, who says: "A small party of this northern species visited Racine during the unusually cold January of 1852." Mr. Nelson states that Dr. Velie has since observed it at Rock Island, Illinois.

FAMILY SITTIDÆ: NUTHATCHES.

FIG. 110.



WHITE-BELLIED NUTHATCH (*Sitta Carolinensis*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-five White-bellied Nuthatches examined	23	Contained		Animal food .	<div></div>
	10			Vegetal food .	<div></div>
	2		2	Beneficial	<div></div>
	5		10	Detrimental ..	<div></div>
	23		56	Unknown.....	<div></div>

Table showing the kinds and number of insects and spiders eaten by the Nuthatches.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-five White-bellied Nuthatches examined	1	Contained	2	Ants.....	<div></div>
	3		6	Lepidoptera..	<div></div>
	2		4	Diptera.....	<div></div>
	14		32	Beetles	<div></div>
	1		1	Spider.	<div></div>
	22		63	Adult forms ..	<div></div>
	1		1	Pupa	<div></div>
	2		4	Larvæ	<div></div>
Of four Red-bellied Nuthatches examined	4	Contained	24	Adult forms ..	<div></div>
	1		3	Ants	<div></div>
	3		15	Beetles	<div></div>

16. *SITTA CAROLINENSIS*, GM. WHITE-BELLIED NUTHATCH. GROUP I.
CLASS b.

This species is another of those birds whose possibilities for usefulness appear to be among the highest; but it is one which can hardly attain, under present management, that abundance in thickly settled districts which could be desired. It has conclusively proved its desire to assume familiar relations with man, and this with only the slightest encouragement. The orchard, ornamental, and shade trees, as well as the groves and scattered patches of woods of thickly settled districts, offer it an ample supply of food and need its protection; but few yet appear to realize that if these birds are to become abundant and of service, they must have places in which to rear their young. They usually place their nests in holes in trees and stumps, which they find ready formed, or excavate for themselves. It is usually regarded as in harmony with thrifty husbandry, in gathering the year's fuel, to select from the woods those trees which give evidence of decay. Such an economy, however, if carried to an extreme, will ultimately leave the Nuthatches and Woodpeckers, and all of those species which breed in hollow trees, without nesting places, and will necessarily extirpate them from sections so modified, and deprive the country of their services, except so far as some of these birds may be able to form new habits which are more in harmony with the altered conditions. The practical questions which these facts suggest are these: Are the services of this class of birds sufficiently great to justify the preservation of their nesting places? Is it probable that these birds can so modify their habits as to place themselves in harmony with the new features which our country is assuming so rapidly? That this Nuthatch gathers its food from a field where some of our most destructive insects abound, there can be no question. In proof of this, it need only be said that almost its whole time is spent searching about and upon the trunks and larger branches of trees in quest of insects, and that in such situations as these the wingless female of the canker-worm, the larvæ and pupæ of the codling moth, the adults of the round-headed and flat-headed apple-tree borers, and a host of nocturnal moths and other insects may be destroyed by it. That the particular insects which have been mentioned are so destroyed cannot be asserted positively at present, yet it is highly probable that they are, for its record of food, meagre as it is, proves that it does feed upon closely allied forms.

In regard to the other question little can be said at present. The fact, however, that the Nuthatch does not always excavate the holes for its nest indicates that it is not very particular, and gives some grounds for the hope that it may yet be induced to breed commonly in groves and orchards. Wilson states that it sometimes nests in hollow rails in fences, and in the wooden cornice under the eaves of houses. When an old tree is cut down, whose branches are hollow and have been occupied by these or other birds, it would be very desirable, by way of experiment, to fasten the perforated portions of the limbs in other trees to ascertain whether they might not in those conditions still be used by birds as breeding places. The same experiment might be tried in orchards. Should they prove acceptable to the birds there would then be no need of allowing all decaying trees to stand for this purpose.

Food: Of twenty-five specimens examined, fourteen had eaten thirty-two beetles — among which were three elaters, one long-horn and a lady-bug(?); one, two ants; one, two caterpillars; one, two grubs of a beetle; one, a spider; one, a chrysalid; one, small toad-stools; five, acorns; and one, corn.

According to others: Ants, bugs, insects and their larvæ, spiders (Wils.). Larvæ and eggs of insects (Samuels). Insects are its favorite food at all times.

It seems to break open acorns and chestnuts for the included insects (Aud.). Prof. Forbes records finding in the stomachs of four birds of this species evidence that it eats many beetles, Nitidulidæ, Cetoniidæ and lady-bugs. One had eaten corn.

17. *SITTA CANADENSIS*, LINN. **RED-BELLIED NUTHATCH.** GROUP I.
CLASS a.

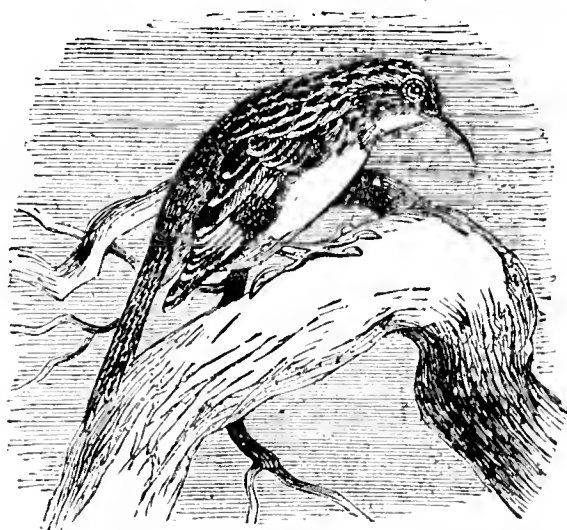
This species, so far as I know it personally, is only a' migrant of a somewhat meagre and irregular abundance. A few, however, are said to nest near Racine, and a greater number in the northern portion of the state. Mr. Nelson mentions it as a rare summer resident in Northeastern Illinois. It was not observed in the woods of Oconto county during the month of August, 1875, nor during a trip of a week, from Worcester to Wisconsin Valley Junction, the last of July, 1876. In October of 1877, it was observed several times in the woods along the Flambeau river. I have taken but four specimens—September 12, 1876,—and except those mentioned above, these are the only ones which I have observed. It is said to build its nest in low dead stumps, seldom more than four feet from the ground. Mr. Rice¹ is said to have observed a pair feeding their unfledged young the last of April, 1874, in an excavation in a tree, standing on one of the principal streets of the town of Evanston. The similarity, in habits and haunts, of this species to its more familiar congener, renders it probable that it does a similar, though less important work. Its more northern habitat suggests that it can hardly be of much service to us except during its migrations.

Food: The four specimens examined had in their stomachs fifteen beetles, three ants and six other small insects.

Insects and their larvæ and fine seeds (Wils.). Insects and the seeds of evergreens (De Kay). Insects and their larvæ which are caught in the crevices of bark and under it (Aud.).

FAMILY CERTHIIDÆ: CREEPERS.

FIG. 111.



BROWN CREEPER (*Certhia familiaris*). After Baird, Brewer and Ridgway.

¹ Birds of Northeastern Illinois, by E. W. Nelson.

18. *CERTHIA FAMILIARIS*, LINN. **BROWN CREEPER.** GROUP I. CLASS b.

The Brown Creeper is another of those birds, which, like the Nuthatches, scrambles about the trunks and larger branches of trees in quest of food, using its long, slender, decurved bill to remove those small insects that hide in the crevices of the bark and under it. In the northern portions of the state it is resident throughout the year. In the fall it spreads southward, to return again in the spring. Its favorite haunts are the deep, heavy woods, but during its migrations it ventures near the abodes of man and is often seen in cities. Mr. Nelson states that he has seen as many as a dozen of these birds upon the sides of a house at once, in Chicago, searching after small spiders.

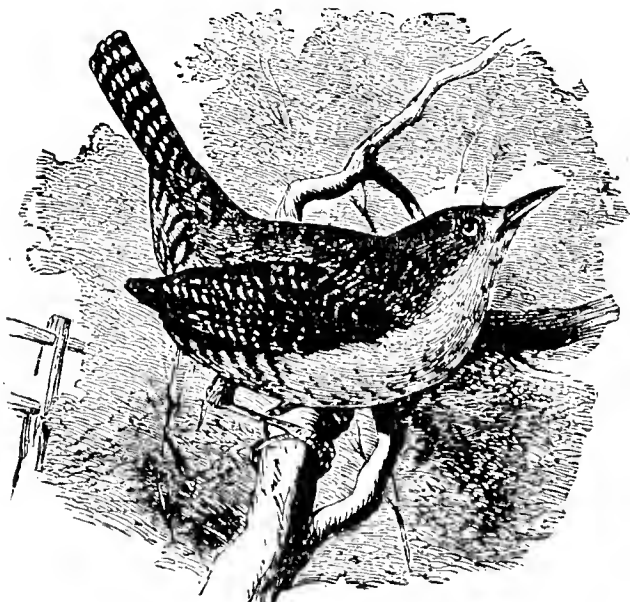
Enough has been said, in the introduction, to indicate the value of the kind of work which this bird does, and that it should be more abundant. It is difficult to explain why birds which lay as many eggs as this and the Black-capped Titmouse do, and in places apparently so secure from the plunderers of birds' nests, as we know them, do not become more numerous. The subject is one which needs careful investigation. It may be added, in connection with what has already been said of squirrels robbing birds' nests, that the chipmunk has been known to capture and carry away young chickens, and that this fact suggests that it may also be a dangerous enemy to small birds. If so, its small size enables it to enter almost any nest which is built in hollow trees, and, hence, only the ability of the bird to ward off its attacks remains as a safeguard against it. I make these statements not as an accusation against the little striped squirrel, but as indicating a field in which careful observation is needed. The flying squirrel, too, as I have shown in another place, is fond of birds' eggs, and might rob the nests of these and other birds in their absence. The little red squirrel, in many cases, might also enter the nests of this species.

Food: Only three stomachs of this species have been examined; one was empty, one contained three small beetles, and one three small insects.

Bugs, pine seeds and fungi (Wils.). Insects and the seeds of pines (De Kay). Spiders (E. W. Nelson).

FAMILY TROGLODYTIDÆ: WRENS.

FIG. 112.

**HOUSE WREN** (*Troglodytes domesticus*). After Baird, Brewer and Ridgway.

Tabular Summary of Eeonomic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and snails taken from the stomachs, classified as to economic relations under the heads Benefieial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECI-MENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of six House Wrens examined.....	6	Contained		Animal food.....	
				Vegetal food	
	4		8	Beneficial	
	6		25	Detrimental	
Of three Winter Wrens examined	3	Contained		Animal food.....	
				Vegetal food	
	1		1	Beneficial	
	1		1	Detrimental	
Of fourteen Long-billed Marsh Wrens exam-ined	3	Contained	12	Unknown.....	
	14			Animal food.....	
	1			Vegetal food	
	1		1	Beneficial	
Of four Short-billed Marsh Wrens exam-ined	6	Contained	11	Detrimental	
	10		45	Unknown.....	
	4			Animal food.....	
	1			Vegetal food	
Of four Short-billed Marsh Wrens exam-ined	2	Contained	3	Detrimental	
	1		5	Unknown.....	
				Beneficial	
				Animal food.....	

Table showing the kind and number of insects and snails eaten by the Wrens.

NUMBER AND NAME OF SPECI-MENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of six House Wrens examined	3	Contained	7	Caterpillars	
	2		9	Beetles	
	1		1	Grasshopper	
	6		26	Adult forms.....	
	3		7	Larvæ	
Of three Winter Wrens examined	1	Contained	3	Ants.....	
	1		1	Caterpillar	
	1		3	Beetles	
	1		1	Dragon-fly.....	
	3		13	Adult forms.....	
	1		1	Larve	

Table showing the kind and number of insects and snails eaten by the Wrens — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of fourteen Long-billed Marsh Wrens examined	1	Contained	1	Ant.....	
	4		4	Lepidoptera.....	
	1		3	Diptera.....	
	7		21	Beetles	
	2		7	Hemiptera	
	2		2	Grasshoppers	
	1		1	Dragon-fly.....	
	1		1	Snail	
	14		51	Adult forms.....	
	1		1	Larve	
Of four Short-billed Marsh Wrens examined.....	2	Contained	2	Moths	
	2		4	Diptera.....	
	4		18	Adults.....	

19. THYOTHORUS LUDOVICIANUS (GM.), BP. CAROLINA WREN. GROUP II.
CLASS a.

The habitat of this Wren is so peculiarly southern that it can only be regarded, at present, as a rare straggler in Wisconsin.

20. TROGLODYTES DOMESTICUS (BARTR.), COUES. HOUSE WREN. GROUP I.
CLASS b.

The House Wren is a common summer resident, but at present, with us, a bird of heavily timbered districts rather than of openings and prairie sections. In the older Eastern and Middle States it has assumed much more familiar and intimate relationship with man than with us; there it is common about dwellings and nests in bird-houses, in the cornice of buildings, under the eaves, and in hollow cherry trees. Habits similar to these are being assumed by our birds, but at present they are most abundant in woods where the upturned roots and tangled branches of trees are common. It is very destructive to insects, feeding almost entirely, if not wholly, upon them, and is, therefore, a bird which any abundance cannot make destructive to grains or fruits. It rears a large family, and often two each season.

No pains should be spared in attracting these birds to our dwellings and in establishing their homes along the fence-rows of cultivated fields. The accusation that is brought against them in the East, of their driving Bluebirds out of their houses and appropriating them to their own use, is no great objection. Houses enough and to spare should be gladly provided for both species. This, however, is to be said in regard to the disposition of these two species upon the farm. The size of the Bluebird, its method of obtaining food, and its haunts, fit it best for work in the open fields, where it should be especially encouraged; the House

Wren is especially fitted to do work among the shrubbery of orchards, gardens and yards, and these, particularly, should be the foci of its labors.

Food: From three specimens were taken seven caterpillars; from two, nine beetles; and from one, a grasshopper.

Insects and their larvæ (Wils.). Insects, their larvæ, and spiders (Samuels).

Four specimens examined by Prof. Forbes contained only beetles and hemiptera. The beetles were ground-beetles and Hydrophilidæ.

21. *ANORTHURA TROGLODYTES HYEMALIS* (WILS.), COUES. **WINTER WREN.**
GROUP I. CLASS b.

In the northern portion of the state among the heavy timber, where this species is common, it is a summer resident. In this region it frequents the line of the Wisconsin Central Railroad, and often affects the large piles of slabs that are drawn out from the saw-mills. In the southern portion of the state it only occurs during its migrations.

Food: Of three specimens examined one had eaten three ants; one, a geometrid caterpillar; one, three beetles; and one a dragon-fly.

Insects and their larvæ (Wils.). Prof. Forbes found in one stomach evidence of ants, moths, caterpillars, ground-beetles, rove-beetles, diptera, day-flies and spiders.

22. *TELMATODYTES PALUSTRIS* (BARTR.), CAB. **LONG-BILLED MARSH WREN.**
GROUP I. CLASS b.

As the name of this species implies, it is a denizen of marshy tracts, and in all of these places it is an abundant summer resident. Its broods are two; and its eggs six or eight in number. It loves best the swampy borders of streams, lakes, and ponds, where coarse sedges, reeds and wild rice abound, but it also frequents the adjoining wet meadows.

Food: Of fourteen specimens examined one ate one ant; one, a caterpillar; one, three beetles; three, three moths; one, a small grasshopper; one, five grasshopper eggs; one, one dragon-fly; and one a small snail.

According to others, flying insects and their larvæ, and a small green grasshopper which inhabits the reeds (Wilson). Aquatic insects and diminutive mollusks (Audubon). Entirely insects captured at rest (Cooper).

23. *CISTOTHORUS STELLARIS* (LICHT.), CAB. **SHORT-BILLED MARSH WREN.**
GROUP I. CLASS b.

This Wren is a common summer resident with us, but far less abundant than its long-billed cousin. Although it affects situations similar to those of the last species, it is, on the whole, a more upland bird. I have never found its nest in wet sloughs, but always in low damp meadows, where no water stands during the summer. It rears two broods each season. The second, which appears late in July, or early in August, is often unavoidably destroyed when the grass is cut, and this fact doubtless accounts, in part, for its less abundance with us than the last species.

The Short-billed Wren is smaller than the last species, but its place of nesting lends to its services a greater comparative value. It is almost wholly insectivorous, and the smallest bird which frequents meadows. For this reason it is especially to be encouraged. Late haying in their breeding haunts would prob-

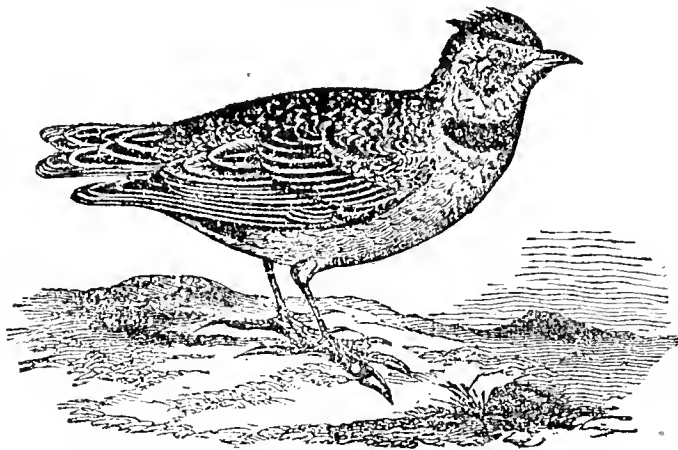
ably tend to make them more abundant, but it is doubtful whether their services will compensate for the injury that would result to the hay crop by allowing it to stand so long.

Food: Of four specimens examined, two had eaten four moths; two, four diptera, among which was one tipulid.

Insects and spiders (Samuels).

FAMILY ALAUDIDÆ: LARKS.

FIG. 113.



HORNED LARK (*Eremophela alpestris*). After Coues.

24. EREMOPHELA ALPESTRIS (LINN.), BOIE. HORNED LARK; SHORE LARK. GROUP I. CLASS b.

Without reference, in the present connection, to the varieties of this species which have been designated, except to state that *leucolaema* is probably the only form that breeds in the state, it may be said that this highly terrestrial and graminivorous bird is rather common in suitable places during most of the year, but that it is only abundant late in the fall and early in the spring. Except during the breeding season, it is gregarious in its habits, and its usual haunts are dry, open fields. Fields of newly sowed grain are sometimes visited by these birds both in the spring and fall, but the little injury that they do in picking up grain at present is slight when compared with the immense amount of seeds of various weeds which they consume during the year. Although it rears two broods each year, the exposed situations in which its nest is located appears to preclude any very considerable abundance.

Food: Five out of six specimens examined had eaten only the seeds of weeds, among which were those of the black bind-weed, the pigeon-grass and pig-weed; the remaining specimen had in its stomach winter wheat.

Small black seeds, buckwheat, oats, buds of sprig birch and larvæ of certain insects (Wilson). Seeds and insects which it finds among the grass (Cooper). Seeds of grasses, insects and mollusks (Samuels). Of seven specimens examined by Prof. Forbes, one had eaten ground-beetles; one, a fungus-beetle (*Cryptophagidæ*); one, a rove-beetle; two, leaf-chafers; one, a predaceous hemiptera (*Reduviidæ*); and six, seeds of weeds.

FAMILY MONTACILLIDÆ: WAGTAILS.

25. ANTHUS LUDOVICIANUS (GM.), LICHT. TITLARK; PIPIT; WAGTAIL.
GROUP I. CLASS a.

This gregarious and highly terrestrial species is only a migrant in Wisconsin. It passes us southward in October and returns again in April and May, and during these times it is probably common, although I have met with but a single flock. Its haunts are plowed fields, pastures, meadows, the banks of streams and the shores of lakes.

Food: The two specimens which were examined had in their stomachs several small beetles and heteropterous insects.

Various small seeds (Wilson). When along shores, minute shells, small shrimps, and insects found among drift-weeds; when in meadows and plowed fields, insects and seeds (Audubon). Seeds and insects (Cooper). On the beach, small mollusks and animalculæ; in pastures and fields, insects, spiders, and seeds of grasses and weeds (Samuels).

FAMILY SYLVICOLIDÆ: AMERICAN WARBLERS.

FIG. 114.

ORANGE-CROWNED WARBLER (*Helminthophaga celata*). After B., B. and R.

FIG. 115.

BLACK-AND-WHITE CREEPING WARBLER (*Mniotilta varia*). After B., B. and R.

FIG. 116.

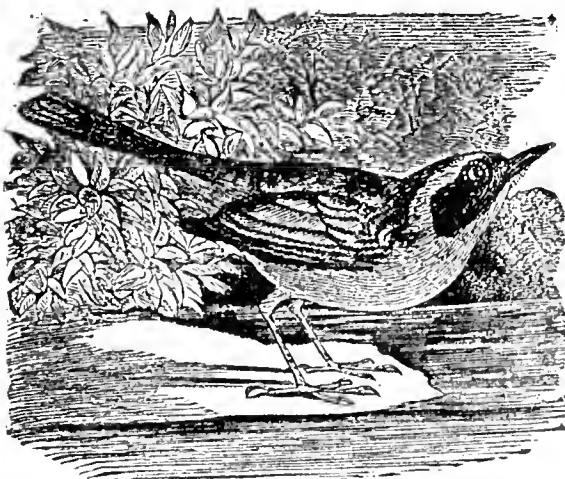
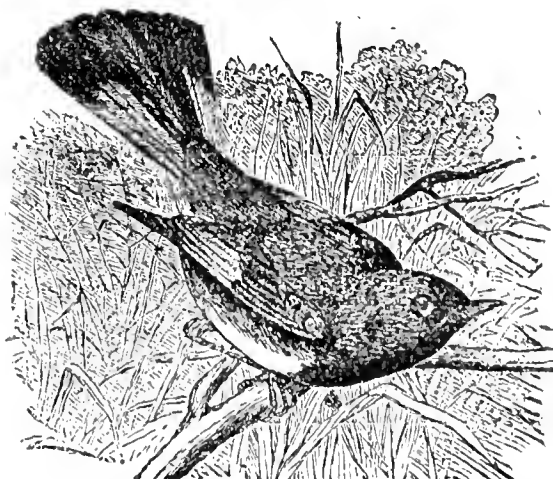
MARYLAND YELLOW-THROAT (*Geothlypis trichas*). After B., B. and R.

FIG. 117.

REDSTART (*Setophaga ruticilla*). After B., B. and R.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects, spiders, worms and snails taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of seventeen Black and White Creepers examined	17	Contained		Animal food		
				Vegetal food		
	6		34	Beneficial		
	16			Detrimental		
		Contained		Unknown.....		
	33		90	Animal food		
				Vegetal food		
	12			Beneficial		
Of thirty-three Tennessee Warblers examined		Contained		Detrimental		
	31			Unknown.....		
			112			
Of twelve Black-throated Green Warblers examined	12	Contained		Animal food		
				Vegetal food		
	5		9	Beneficial		
	11			Detrimental		
		Contained		Unknown.....		
	6		2	Animal food.....		
				Vegetal food		
Of six Black-throated Blue Warblers examined	1	Contained		Beneficial		
	6			Detrimental		
			22	Unknown.....		
	21	Contained				
	1					
	2		5	Animal food.....		
				Vegetal food		
Of twenty-one Yellow-rumped Warblers examined	5	Contained	25	Beneficial ..		
				Detrimental		
	19		75	Unknown.....		
	9	Contained				
	1					
	1		1	Animal food.....		
				Vegetal food		
Of nine Hemlock Warblers examined.....	6	Contained	29	Beneficial		
				Detrimental		
	8		26	Unknown.....		

Tabular Summary of Economic Relations of American Warblers—continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of nineteen Bay-breasted Warblers examined	19	Contained		Animal food.....		
				Vegetal food		
	2		3	Beneficial		
	6		15	Detrimental		
	17		71	Unknown.....		
Of eleven Chestnut-sided Warblers examined	11	Contained		Animal food.....		
				Vegetal food		
	4		21	Detrimental		
	9		29	Unknown.....		
Of seventeen Black and Yellow Warblers examined	17	Contained		Animal food		
				Vegetal food		
	1		1	Beneficial		
	8		23	Detrimental.....		
	16		48	Unknown.....		
Of eight Palm Warblers examined	8	Contained		Animal food		
				Vegetal food		
	1		1	Beneficial		
	2		10	Detrimental		
	6		41	Unknown.....		
Of ten Oven-birds examined	8	Contained		Animal food		
	8			Vegetal food		
	1		3	Detrimental		
	8		23	Unknown.....		
Of seven Water Wagtails examined	7	Contained		Animal food		
	1			Vegetal food . . .		
	1		1	Beneficial		
	2		5	Detrimental		
	7		46	Unknown.....		
Of twenty-one Maryland Yellow-throats examined	21	Contained		Animal food		
				Vegetal food		
	4		12	Beneficial		
	7		44	Detrimental		
	18		78	Unknown.....		

Tabular Summary of Economic Relations of American Warblers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-nine Redstarts examined.....	29	Contained		Animal food	
				Vegetal food	
	2		4	Beneficial	
	3		5	Detrimental	
	29		173	Unknown.....	

Table showing kinds and numbers of animals, mostly insects, eaten by American Warblers.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of seventeen Black-and-white Creepers examined	3	Contained	5	Ants.....	
	5		25	Lepidoptera.....	
	3		5	Diptera.....	
	6		16	Beetles	
	2		7	Heteroptera	
	1		1	Caddis-fly	
	1		1	Snail.....	
	17		91	Adult forms.....	
	3		22	Larvæ.....	
Of thirty-three Tennessee Warblers examined	2	Contained	2	Hymenoptera	
	7		13	Caterpillars	
	3		15	Diptera.....	
	6		13	Beetles	
	3		42	Plant-lice.....	
	3		35	Heteroptera	
	33		189	Adult forms	
	11		19	Larvæ.....	
	1		11	Insect eggs.....	
Of twelve Black-throated Green Warblers..	4	Contained	8	Lepidoptera.....	
	1		2	Diptera.....	
	3		11	Beetles	
	1		1	Heteroptera	
	10		42	Adult forms	
	4		13	Larvæ.....	

Table showing kinds and number of animals, mostly insects, eaten by American Warblers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of six Black-throated Blue Warblers examined	1	Contained	2	Ants.....	
	1		2	Caterpillars.....	
	1		5	Beetles	
	6		22	Adult forms.....	
	1		2	Larvæ.....	
Of twenty-one Yellow-rumped Warblers examined	4	Contained	22	Lepidoptera....	
	5		14	Diptera.....	
	15		48	Beetles	
	1		4	Hymenoptera	
	1		1	Caddis-fly	
	1		1	Spider	
	19		84	Adult forms.....	
	3		21	Larvæ.....	
Of nine Hemlock Warblers examined	2	Contained	8	Hymenoptera	
	5		19	Caterpillars	
	3		7	Diptera.....	
	4		9	Beetles	
	2		2	Heteroptera	
	8		37	Adult forms.....	
Of nineteen Bay-breasted Warblers examined ...	5	Contained	19	Larvæ.....	
	3		7	Ants.....	
	6		7	Lepidoptera.....	
	3		6	Diptera.....	
	7		15	Beetles ...	
	1		6	Leaf-hoppers.....	
	1		1	Dragon-fly.....	
	18		80	Adult forms.....	
	5		6	Larvæ.....	
Of seventeen Black-and-yellow Warblers examined	1	Contained	1	Pupa.....	
	3		4	Hymenoptera	
	6		18	Lepidoptera	
	6		15	Diptera... ..	
	6		12	Beetles	
	15		50	Adult forms.....	
	7		20	Larvæ.....	

Table showing kinds and number of animals, mostly insects, eaten by American Warblers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of eleven Chestnut-sided Warblers examined.....	1	Contained	3	Ants.....	
	2		4	Caterpillars	
	1		1	Tipulid	
	5		12	Beetles	
	1		15	Plant-lice.....	
	1		1	Grasshopper	
	10		44	Adult forms	
	5		7	Larvæ.....	
Of eight Palm Warblers examined.....	1	Contained	1	Hymenoptera	
	1		5	Moths	
	1		3	Diptera.....	
	2		13	Beetles	
	1		5	Plant-lice.....	
	8		49	Adult forms	
	1		3	Larvæ.....	
Of ten Oven-birds examined.....	1	Contained	3	Caterpillars	
	1		3	Beetles	
	7		23	Adult forms.....	
	1		3	Larvæ.....	
Of seven Water Wag-tails examined	2	Contained	6	Diptera	
	3		6	Beetles	
	2		3	Orthoptera	
	1		1	Dragon-fly	
	1		1	Hair-worm	
	4		14	Snails	
	6		45	Adult forms	
	2		4	Larvæ.....	
Of twenty-nine Red-starts examined.....	1	Contained	4	Orthoptera eggs.	
	4		4	Hymenoptera ...	
	25		5	Lepidoptera.....	
	1		90	Diptera.....	
	9		1	Heteroptera	
	29		19	Beetles	
	1		190	Adult forms	
	1		2	Larvæ.....	

Table showing kinds and number of animals, mostly insects, eaten by American Warblers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of twenty-one Maryland Yellow-throats examined.....	2	Contained	3 Hymenoptera	
	8		35 Lepidoptera	
	4		7 Diptera	
	6		16 Beetles	
	3		7 Hemiptera	
	1		2 Grasshoppers	
	3		6 Dragon-flies	
	2		3 Spiders	
	21		103 Adult forms . . .	
	7		35 Larvæ	
	1		2 Grasshopper eggs	

26. MINIOTILTA VARIA (LINN.), VIEILL. BLACK-AND-WHITE CREEPING WARBLER. GROUP I. CLASS a.

If this active little species was ever more closely united, in habits and structure, to the “wood warblers par excellence,” it has, probably, in some distant time, found with them so vigorous a competition as to oblige it to seek a living with a much smaller class of birds. Whatever may have been its habits in previous ages, it is to our advantage that it has assumed the creeper-like life it leads. It is another of those birds which has learned that a large number of nocturnal insects court security by day in the crannied bark of trees, or resort there to undergo their transformations, and, like the Nuthatches and true Creepers, upon such forms it feeds. Sometimes it pursues upon the wing moths which it has startled from their hiding places, and occasionally it searches for insects among the foliage of trees.

The Black-and-white Creeper is a rather common summer resident, and it usually affects, during the breeding season, unpastured groves and woods, where it builds its nest upon the ground, depositing therein from three to seven eggs; from these places, after the middle of July, it disperses over other woods and groves and often appears in orchards and about dwellings. It has been known to build its nest in the immediate vicinity of houses, and the fact bespeaks for it a growing familiarity and a greater usefulness. It is doubtful, however, owing to its breeding habits, whether it can ever become abundant about dwellings during the breeding season, at least where dogs and cats are allowed to live. These birds are often doomed to become the foster parents of the Cowbird, and no doubt their general abundance is greatly reduced on this account. Owing to the small size of these birds, they find it profitable to feed extensively upon very small insects. For this reason they are able to do a work for which the Nuthatches and Woodpeckers are not so well fitted. It is, therefore, especially desirable that they should attain a greater abundance with us.

Food: Of seventeen specimens examined, three had eaten five ants; two, twenty-one caterpillars, twenty of which were small measuring-worms; three,

four moths; three, five diptera; six, sixteen beetles, one of which was a curculio; two, seven heteroptera; one, a caddis-fly; and one, a small snail (*Physa*). Two had eaten one hundred and one insect eggs, but these, I believe, were contained in insects which the birds had eaten.

Ants and other insects (Wilson). Insects and their larvæ (Brewer). Insects which hide under the bark of trees and in its crevices (De Kay). Beetles and moths (Forbes).

27. *PARULA AMERICANA* (LINN.), BP. **BLUE YELLOW-BACKED WARBLER.**
GROUP I. CLASS b.

This elegant little Warbler appears to be nowhere abundant, and, throughout its range, seems to be largely confined to particular localities. Mr. Nelson, however, speaks of it as an abundant migrant, and as breeding rarely in Northeastern Illinois. I obtained a single specimen September 15, 1876. It was flitting among the outermost branches of the trees, in a piece of high, open woods, when taken. It is said to frequent the tops of the tallest trees, and to move with great agility among the terminal foliage in quest of winged insects and caterpillars. Orchards and all sorts of woodlands are said to be visited by it.

Food: Six small insects were taken from one stomach.

Small winged insects and caterpillars (Wilson). Winged insects and caterpillars (Brewer). Small caterpillars (*Geometridæ*), small lace-winged flies and small spiders (Samuels).

28. *HELMINTHERUS VERMIVORUS* (GM.), BP. **WORM-EATING WARBLER.**
GROUP II. CLASS a.

This southern species appears to be a very rare visitant. Dr. Hoy has said that a few nest near Racine, and Mr. Nelson states that a single specimen was observed at Waukegan, May 21, 1876.

29. *HELMINTHOPHAGA CHRYSOPTERA* (LINN.), BD. **BLUE GOLDEN-WINGED WARBLER.** GROUP II. CLASS a.

This species appears to be nowhere abundant. Mr. Nelson speaks of it as "comparatively rare" in Northeastern Illinois, and two nests are reported to have been taken near Racine by Dr. Hoy. Its nest is placed upon the ground, and, at times, becomes the receptacle for the eggs of the Cowbird.

30. *HELMINTHOPHAGA RUFICAPILLA* (WILS.), BD. **NASHVILLE WARBLER**
GROUP I. CLASS a.

Both Dr. Hoy and Mr. Nelson speak of this Warbler as common during the migrations, along the lake shore, in the spring and fall. This has not been my experience for Central Wisconsin. The only specimens which I have seen were taken near Waupaca. They represented both sexes and were taken in different localities. The first, a male, was taken July 21st, while perched upon the limb of a dead poplar which was standing in an old "clearing" overgrown with small poplars, between large piles of brush. The second was obtained in a grove of small tamaracks, while it was nimbly searching for food among the delicate sprays. Mr. Allen states that at Springfield, Mass., during two or three weeks of the spring migration, these birds are common in the orchards and gardens, actively gleaning insects among the unfolding leaves and blossoms of fruit trees. It nests upon the ground.

Food: The two specimens examined had in their stomachs four small green caterpillars, and a few very fine fragments of insects.

31. *HELMINTHOPHAGA CELATA* (SAY), BD. **ORANGE-CROWNED WARBLER.**
GROUP II. CLASS a.

This species, like the last, I believe to be of rare occurrence in Central Wisconsin. Mr. Nelson, however, says that it is common, during its migrations, along the lake shore. Possibly this species, in its autumnal dress, which so closely imitates that of the next, has been mistaken for that species.

Food: Insects (Cooper). Insects taken chiefly among the branches of trees, and shrubbery, but also upon the wing (Audubon).

32. *HELMINTHOPHAGA PEREGRINA* (WILS.), CAB. **TENNESSEE WARBLER.**
GROUP I. CLASS b.

This Warbler is extremely abundant during some of its fall migrations. During September of 1876 the borders of groves literally thronged with these little nymphs of the woodland, and hundreds of them might have been easily obtained. During September of 1877 they were much less numerous, but common. The first arrivals were noted August 15, but the body of them came along after the first of September. Its favorite haunts, in the fall, are the borders of groves, but it is a frequent visitor to orchards and vineyards. It is also to be found in willow thickets along the margins of streams, among the foliage of high open woods, and in tamarack swamps. I have twice taken it in cornfields bordered by groves, and in the stomach of each of these was found a greenish plant louse, probably *Aphis maidis*, Fitch.

It is very dexterous in its movements, and obtains the greater part of its food upon and among the terminal foliage of trees. Titmouse-like, it often swings pendant from a leaf while it secures an insect which it has discovered. Small insects of various kinds, not especially attractive to larger birds, are destroyed by this species in large numbers; and its slender, acute bill serves it much better in picking up these forms than a heavier, more clumsy one could. There is another use, however, to which this Warbler puts its slender, acute bill, and for which it is well adapted. It is that of probing ripe grapes, apparently for the purpose of obtaining the sweet juice. September 8, 1876, I observed one of these birds picking at a cluster of ripe Delaware grapes, and upon examination it was found that two of the berries had been recently pierced with some sharp instrument, and that the juice was oozing from the wounds. On inquiring of Mr. Bates, a grape-grower at Whitewater, whether there were any birds which troubled seriously his grapes, he informed me that there was a little green "Grape-sucker" which troubled him very much some seasons, and that it was now at work upon his Delaware and Catawba grapes. I examined his vineyard and found that many of his grapes were probed in the manner described above, as high as eight berries on some bunches being thus injured. Only the ripe grapes appeared to be molested, and the sweet varieties, he says, are preferred to the sour.

As soon as the berries are wounded they are attacked by ants, bees and flies, and soon destroyed. I requested Mr. Bates to secure one of the "Grape-suckers" for me, and the next morning he kindly presented me with a bird of this species. Mr. Floyd, of Berlin, informed me in September, 1873, that there was a little green bird with a very sharp bill sucking his grapes, but he was unable to obtain a specimen. Mr. Lowe, of Palmyra, enters the same complaint against a similar bird. From this evidence I think that there can be no doubt that this species is injurious to grapes in the manner described. It does by no means

follow, however, that the bird should be exterminated. I am confident that the service which this species renders in Wisconsin alone, during its hurried transits in the fall and spring, more than compensates for what injury it may do to grapes. It is unfortunate that the grape-grower should be obliged to sustain the whole injury of this species while the state at large shares its benefits, but such conditions are common, and, so far as I can see, to be endured. Should it be proved that the injury which the state sustains from this Warbler is greater than the service it receives, it would not then follow, as was stated in the "Introduction," that it should be exterminated. We are not the only people whose interests are affected by this bird. What the extent of its services during its five months' stay in the south is, we do not know. Until we do, we should be cautious how we destroy it for any trivial injury which it may do.

Food: Of thirty-three specimens examined, two had eaten two very small hymenoptera (probably parasitic); seven, thirteen caterpillars; three, fifteen diptera; six, thirteen beetles; three, forty-two plant-lice, among which were two specimens of the corn plant-louse *Aphis maidis* (?); three, thirty-five small heteroptera, .09 of an inch long; and one, eleven insect eggs.

33. *DENDRÆCA ÆSTIVA* (GM.), BD. **BLUE-EYED YELLOW WARBLER;
GOLDEN WARBLER; SUMMER YELLOWBIRD.** GROUP I. CLASS b.

This elegant little species and common summer resident frequents most commonly the willow clumps of alluvial meadows, but is also to be seen in groves, along wooded water-courses, and in villages, orchards and gardens. In the Eastern and Middle States it is much more familiar and abundant than with us. At Ithaca, N. Y., it nests very commonly in the city, building in the shade and fruit trees, sometimes so close to the windows of the dwellings that its nest can almost be reached from them. It only requires suitable breeding places to become, in time, extremely serviceable as a destroyer of garden and orchard insects. It loves to search for insects in rosaries and among berry bushes.

Food: Of five specimens examined, two had eaten four small larvæ; two, two beetles.

Small green caterpillars (Wils.). Said to feed on juicy fruits in autumn (Cooper). Canker-worm (Maynard). Hymenoptera, moths and caterpillars, among them canker-worms, beetles, diptera, hemiptera, spiders and myriapods (Forbes).

34. *DENDRÆCA VIRENS* (GM.), BD. **BLACK-THROATED GREEN WARBLER.**
GROUP I. CLASS a.

Migrant. Common during the middle of May, and again during nearly the whole of September; a few are said to breed in the state. Much of its food is taken upon the wing among the branches of trees. During its migrations it may usually be seen darting among the uppermost branches of high open woods, but tamarack swamps, groves, and orchards are also visited by it.

Food: Of twelve specimens examined, one had eaten a moth; three, seven caterpillars; one, two diptera; one, six larvæ—probably caterpillars; three, eleven beetles; and one, a heteroptera.

The smaller winged insects, caterpillars and other larvæ (Brewer). Larvæ of insects that prey upon opening buds (Wilson). Hymenoptera, caterpillars and curculios (Forbes).

35. *DENDRÆCA CÆRULESCENS* (LINN.), BD. **BLACK-THROATED BLUE
WARBLER.** GROUP I. CLASS a.

Migrant. I have not found it common. Its favorite haunts are among the heavy timber, but it also visits groves, low, damp thickets, and village shade-trees. A considerable portion of its food is gleaned from the bark of the larger branches of trees. It poises itself, upon the wing, humming-bird-like, to remove insects from the under sides of large limbs, and I have seen it light upon the trunks of trees for the same purpose. Dr. Brewer states that it is an expert catcher of small-winged insects. One of these birds came into the school-room at Berlin in May, 1875.

Food: Of six specimens examined, all had eaten insects; one, two ants; five, beetles; and one, two caterpillars.

Larvæ, the eggs of insects and spiders (Brewer).

36. *DENDRÆCA CÆRULEA* (WILS.), BD. **CÆRULEAN WARBLER.** GROUP II.
CLASS a.

Mr. Nelson, in his "Birds of Northeastern Illinois," says of this species: "A regular but rare migrant. May 12th to 20th, and the first of September. Prefers high woods. Rare summer resident here, but near Detroit, Michigan, I am informed it is one of the common species at this season." Of its occurrence in Wisconsin, Dr. Hoy says: "Not common. A few breed."

37. *DENDRÆCA CORONATA* (LINN.), GRAY. **YELLOW-RUMPED WARBLER.**
GROUP I. CLASS b.

This Warbler, like most of its genus, is only a migrant. A few may breed in Northern Wisconsin, for I obtained a male at Elk Lake in Chippewa county, July 26, 1876.

During the fall, from the middle of September until well along toward November, it is extremely abundant, when it may always be seen in dry open fields, along fences and roadsides, and often in orchards and gardens about dwellings. On cold, windy days it often hops and flits about porches and windows in quest of flies. It also occurs in groves, woods, and tamarack swamps. It is an adept at catching insects on the wing, but it secures more of the steady flying coleopterous forms than those which have a jerky, zigzag flight.

Food: Of twenty-one Yellow-rumped Warblers examined, one had eaten a moth; two, twenty-one caterpillars—mostly measuring-worms; five, fourteen diptera, among which were three tipulids; fifteen, forty-eight beetles; one, four of the Ichneumonidæ; one, a caddis-fly; one, a spider; and one, fifteen tipulid eggs. As these eggs were found in the stomach with the tipulids, they, beyond question, were not eaten separately. From the stomach of one bird was taken a single tamarack seed.

Five specimens examined by Prof. Forbes gave evidence of having eaten hymenoptera, among them ichneumons; caterpillars; beetles, among which were leaf-chafers and long-horns; diptera, hemiptera, spiders and seeds.

Larvæ, and berries of wax myrtle (Wilson). Caterpillars and berries of wax myrtle (De Kay). Spiders, insects and their larvæ (Audubon).

38. *DENDRÆCA BLACKBURNIÆ* (GM.), BD. **BLACKBURNIAN WARBLER;
HEMLOCK WARBLER.** GROUP I. CLASS a.

This beautiful species, while among the uppermost branches of high open woods, reminds one both of the Redstart and the Black-and-white Creeper, whose

methods of obtaining food it copies to some extent. It even drops onto the underside of horizontal limbs to secure some insect which may have retreated thither for safety. Besides high open woods, it affects groves and tamarack swamps. In May, 1874, one of these birds came into the school-room at Berlin.

They pass us northward about the middle of May, and return between the 1st and 20th of September. I have taken the males in tamarack swamps as early as August 7th.

Food: Of nine specimens examined, four had eaten nine small beetles; five, nineteen caterpillars; one, ants; and one, small winged insect. In the stomachs of three examined collectively, were found four caterpillars, four ants, one dipterous insect .09 of an inch long, one medium sized heteropterous insect, four large crane-flies, and one ichneumon-fly (?) Another bird had in its stomach one heteropterous insect (*Tingis*), nine small caterpillars, two leaf-beetles, and two large crane-flies. One specimen had eaten beetles and small diptera (Forbes). Small insects and berries (De Kay).

39. *DENDRÆCA STRIATA* (FORST.), BD. **BLACK-POLL WARBLER.** GROUP I.
CLASS a.

The extremely close resemblance between this species and the next in their autumnal attires, renders it very difficult to state, with certainty, which is the more abundant during the fall migration. It is my opinion that the Bay-breasted Warbler far outnumbers this one. It is a migrant, and most of them pass south during the latter half of September. Woods, swampy groves and orchards are its usual haunts in the fall.

Food: Of four specimens examined one had eaten a caterpillar, and one three beetles. Other insects, estimated at thirteen, were observed.

Canker-worm (Brewer). Insects caught upon the wing (Coues). Winged insects (Wilson). Canker-worm (Maynard).

40. *DENDRÆCA CASTANEA* (WILS.), BD. **BAY-BREASTED WARBLER;
AUTUMNAL WARBLER.** GROUP I. CLASS b.

This abundant migrant passes north between the 10th and 25th of May, and returns again, greatly reinforced, between the 1st and 20th of September. At these times it is most abundant in groves of small oaks and in high, open woods adjacent to fields, but orchards, the borders of damp thickets, and clumps of willows in low meadows are also visited by it. It is an active and skillful insect-hunter, and obtains its food along the branches of trees, among the foliage and upon the wing. It is not, however, as habitually a fly-catcher as many others of its genus.

Food: Of nineteen specimens examined, three had eaten seven ants; five, six caterpillars—one of them hairy and 1.5 inches long; one, a moth; three, six diptera; seven, fifteen beetles, among which were two lady-birds (*Chilocorus bivulnerulus*), and two squash beetles (*Diabrotica vittata*); one, six leaf-hoppers (*Cicadellina*); and one, a small dragon-fly. The whole number of insects contained in the nineteen stomachs was eighty-seven, of which eighty were adult forms.

In the stomachs of two birds were found one caterpillar (geometer), five flies, one ichneumon-fly, one winged ant, one small beetle and one small chrysalid.

Larvæ of insects (Wilson). Canker-worm and other insects (De Kay). Small insects, many of which are taken upon the wing. It also searches for insects among the blossoms of the cotton plant (Audubon).

41. *DENDRÆCA PENNSYLVANICA* (LINN.), BD. **CHESTNUT-SIDED WARBLER.**
GROUP I. CLASS a.

It has been my experience to find this Warbler barely common. It is a summer resident from Berlin northward in Central Wisconsin. Dr. Hoy speaks of it as breeding in abundance at Racine, but during three summers' collecting in Jefferson county it was not my fortune to meet with it except during the migrations, and even then, it has been among the rarest of this genus with which I have met. During the breeding season, it has been Mr. Allen's experience to find this bird usually in low woods and swampy thickets, nesting in bushes. Mr. Ridgway found it breeding in oak openings and among the prairie thickets of Southern Illinois. Dr. Hoy states that it prefers localities with a dense underbrush, especially hazel, thinly covered with trees. While at Waupaca, between July 20th and 24th, I met two pairs of these birds busily feeding their broods high among the tops of deep, heavy maple woods, and another similarly engaged on the borders of a tamarack swamp. At Berlin during the month of June I observed it in similar situations. It usually lays four eggs in a nest placed in the upright forks of a low bush. The Cowbird sometimes deposits its eggs in the nests of this species.

Food: Of eleven specimens examined, one had eaten three ants; two, four caterpillars; one, a tipulid; five, twelve beetles; one, fifteen plant-lice; and one, a small grasshopper.

Among the caterpillars were two geometers, marked above, on a yellow ground, with numerous fine wavy black lines. These were very abundant at Berlin in June of 1874, feeding upon the red, white and burr oaks, the hazel, hickory, plum, cherry, apple, pear and currant.

Insects (Wils.). Flies and other insects (De Kay). Canker-worms (Maynard).

42. *DENDRÆCA MACULOSA* (GM.), BD. **BLACK-AND-YELLOW WARBLER.**
GROUP I. CLASS a.

This elegant little Warbler is nearly as abundant as the Yellow-rump, and, like it, a migrant. Its spring migration occurs between the 5th and 28th of May. Between the 2d and 27th of September it returns again to the south. During these movements it frequents groves and the borders of woodlands, where it gleans among the branches and foliage after the manner of the Creepers and Flycatchers. It is also to be seen in osier and alder thickets, in tamarack swamps and in the clumps of willows that grow on wet marshes.

Food: Of seventeen specimens examined, three had eaten four hymenoptera, among which were two ants; one, one moth; six, seventeen caterpillars; six, fifteen diptera; six, twelve beetles; and one, two larvæ. Two tipulids were represented among the diptera.

43. *DENDRÆCA TIGRINA* (GM.), BD. **CAPE MAY WARBLER.** GROUP I.
CLASS a.

This Warbler, once so rare as to have escaped entirely the notice of both Audubon and Nuttall, is apparently becoming not uncommon. Mr. Nelson says of it: "Very common migrant. May 7th to 25th, and September 5th to 20th. In spring, found almost exclusively in the tops of trees; in autumn, found in large numbers along roadsides, borders of woods and fields in company with *D. palmarum*, from which it is with difficulty distinguished at gun-shot, so closely alike are their habits and movements at this season."

The four specimens which I have obtained were taken between September 6th and September 22d. Of these, two were obtained in high open woods, one in a tamarack swamp, and one in a front yard.

Food: Only beetles were identified among the contents of the four stomachs examined, except a single ant. Ten beetles were taken from the stomach of one bird.

44. *DENDRÆCA DISCOLOR* (VIEILL.), BD. **PRAIRIE WARBLER.** GROUP II.
CLASS a.

This Warbler enjoys, as a rule, a more southern latitude than our own, and although Mr. Allen finds it not uncommon in Massachusetts, Mr. Ridgway cites it as rare in Southern Illinois. But one instance of its occurrence in Wisconsin is recorded. As a fly-catcher, Dr. Coues regards it the equal of most of its tribe.

Food: Flies and larvæ (Nuttall). Small caterpillars and winged insects (Wilson). Small insects and flies often seen in cotton fields (Audubon). Insects caught in the air (Coues).

45. *DENDRÆCA DOMINICA ALBILORA*, BD. **YELLOW-THROATED GREY WARBLER.** GROUP II. CLASS a.

This is another of those southern species which probably occurs rarely in the state. As with the last species, Dr. Hoy has noted one instance of its occurrence near Racine. Of its manners, Dr. Brewer says: "It is almost as much of a creeper as *Miniotilta varia*, being frequently seen creeping not only along the branches of trees, but out over the eaves and cornices of buildings, with all the ease and facility of a Nuthatch."

46. *DENDRÆCA PALMARUM* (GM.), BD. **PALM WARBLER.** GROUP I. CLASS a.

The Palm Warbler reaches us, from the British Possessions, early in September, and not until after October has nearly gone have the last of the train passed us for Southern homes. It associates on friendly terms with the Yellow-rumps, whose autumnal dress its own so closely resembles, and with them it drives a vigorous competition along roadsides and fence-rows, and among the rank weeds and low bushes of neglected fields. While it is peculiarly terrestrial in its habits, it is quite an adept at catching insects on the wing. It pursues them from the ground or among the weeds into the air, whither they have taken flight for safety. It even sits upon the lower limbs of trees in open fields, and beats out for passing insects, returning again to the tree with its victim; or, marking from its perch a small moth or beetle in the grass below, it will drop quickly upon its prey, as the Pewee often does. "The odd sheep of the flock," it alone of all this genus, so far as I know, builds its nest upon the ground.

Food: Of eight specimens examined, one had eaten a small hymenoptera; one, five small moths; one, three diptera; two, thirteen beetles; and one, five plant-lice.

47. *DENDRÆCA PINUS* (BARTR.), BD. **PINE-CREEPING WARBLER.** GROUP II.
CLASS a.

This species is said to breed among the pines in the northern portion of our state, and Mr. Nelson speaks of it as a common migrant, passing north between April 27th and May 20th, and returning again between September 15th and Oc-

tober 5th. It has not been my fortune to meet with the species. As its name implies, its favorite haunts are among the coniferous forests, where it frequents the tops of the taller trees. During the spring and fall, in Massachusetts, it frequents situations similar to those chosen by the Palm Warbler, the two species at these times often associating together. While in the forests, its habits are said to closely resemble those of the Creepers, but it is also said to capture insects on the wing.

Food: Seeds of pitch pine and various bugs (Wilson). Insects taken principally among the branches of trees, but occasionally upon the ground; young crickets, and a small red beetle found enclosed in the leaves or stipules of pines (Audubon).

I obtained a single specimen of this species in May of 1880, at River Falls, since the above was written.

48. *SIURUS AUROCAPILLUS* (LINN.), SW. **GOLDEN-CROWNED THRUSH.**
GROUP I. CLASS b.

This trim bird-of-the-woodlands breeds with us commonly. Dry groves and woods are its usual haunts, but it also frequents osier and alder thickets. Most of its time is spent upon the ground, running and scratching among the fallen leaves for food. Here, too, its quaint nest is built, and diligently sought for by the Cowbird as a receptacle for her eggs. Two broods are said to be reared each season.

Food: A considerable portion of the food of this species consists of seeds gathered in the woods. Eight out of ten specimens examined had eaten seeds; one, three caterpillars; and one, three beetles. In the stomachs of five, there were fine bits of insects, none of which were identified.

Ants, small beetles, and caterpillars (De Kay). Small insects, smooth caterpillars, spiders, and berries (Audubon). Seeds, mud-insects, caterpillars, and small turbinated snails (Gosse).

49. *SIURUS NÆVIUS* (BD.), COUES. **WATER THRUSH; WATER WAG-TAIL.** GROUP I. CLASS b.

This is not an abundant bird in Wisconsin, and I have never met with it earlier than August 10th, although a few are said to breed in the dark, gloomy swamps. It is terrestrial in its habits, but more timid and suspicious than its cousin. Unfrequented woodlands where pools abound, or through which some stream runs, are its usual resorts. Sometimes it leaves the wood a mile or more to visit streams winding through marshy tracts. In these places it often wades the shallows to obtain aquatic forms of life which may be within its reach.

Food: The contents of four stomachs, examined collectively, included three dipterous larvæ, two crickets, one grasshopper, three beetles — two of them curculios, — six dipterous insects, one dragon-fly, one hair-worm, six small mollusks, four orthopterous eggs, and two capsules and pedicels of some moss.

Aquatic insects and mollusks (Gosse). Principally aquatic insects (Wilson).

50. *OPORORNIS AGILIS* (WILS.), BD. **CONNECTICUT WARBLER.** GROUP III.
CLASS b.

This rare Warbler is said to be quite abundant in Illinois and Wisconsin in the spring, but very rare in the fall. Mr. Nelson, however, speaks of it as being about equally abundant at both seasons. During the migrations it appears

to prefer swampy places in the vicinity of ponds. Dr. Coues found it frequenting old buckwheat and corn fields searching for food among the rank weeds. Wilson only found it in low thickets. Audubon saw it chasing spiders that run nimbly over the water. Mr. Henshaw found it almost always seeking its food upon the ground, but on two occasions he saw it feeding in the tops of willows, among the fresh pond marshes about Cambridge, Mass. Mr. Jencks has obtained specimens in May which were singing on the lower branches of a pine standing close by a house.

Food: Spiders and small caterpillars (Samuels). Spiders (Audubon).

51. *OPORORNIS FORMOSA* (WILS.), BD. **KENTUCKY WARBLER.** GROUP III.
CLASS b.

A single specimen of this species is reported by Dr. Hoy to have been taken near Racine; and Mr. Nelson speaks of it as a very rare summer visitant from Southern Illinois.

Food: Spiders, insects and their larvæ (De Kay). It destroys great numbers of spiders (Audubon).

52. *GEOTHLYPIS TRICHAS* (LINN.), CAB. **MARYLAND YELLOW-THROAT;
BLACK-MASKED GROUND WARBLER.** GROUP II. CLASS a.

This is a common summer resident in its favorite resorts, and it arrives early in May and has departed again by September 23d. Hazel patches, willow clumps, berry brush and rank weed tangles, and the borders of woods heavily fringed with small bushes, are the surroundings that suit it best, and these are usually chosen in damp situations. During the migrations it also visits open fields, orchards and gardens. It is a diligent insect-hunter, but we must know more of its food, and of the habits of the insects upon which it feeds, before we can know what its real influence is. The dragon-flies, spiders, and hymenopterous insects included in the list below suggest that its injurious effects are not slight; but we know far too little in regard to the actual service which these insects render to enable us to calculate, even approximately, the magnitude of the injury.

Food: Of eight specimens examined, four had eaten, among other insects, eight caterpillars; and three, beetles. Among the contents of the stomachs of eleven birds, examined collectively, were found twenty-two case-bearing caterpillars (*Coleophora?*); five other larvæ—two of them caterpillars; six small dragon-flies; three moths; three dipterous insects; three very small hymenopterous insects; three beetles—among them a squash-beetle; three spiders; two small grasshoppers; one leaf-hopper; two hemipterous insects; and two insect eggs.

53. *GEOTHLYPIS PHILADELPHIA* (WILS.), BD. **MOURNING WARBLER.**
GROUP II. CLASS a.

This species is introduced in this connection on the evidence of its general distribution, and on that of Dr. Hoy's Report. It appears to be an uncommon bird everywhere east of the Mississippi in our latitude. Mr. Trippe, in giving his observations in Minnesota, says of it: "The Mourning Warbler haunts the edges of tamarack swamps and the damp thickets that adjoin them. They are similar in their habits to the Maryland Yellow-throat, but are not so exclusively devoted to thickets and underbrush, frequently ascending the tops of tamaracks, for which they show a great predilection." It obtains the greater part of its

food in a manner similar to that of the last species, but is perhaps a more expert fly-catcher.

54. *ICTERIA VIRENS* (LINN.), BD. **YELLOW-BREASTED CHAT.** GROUP I.
CLASS b.

This is another of the birds which is seen but rarely in Wisconsin, and its regular occurrence north of Pennsylvania is disputed. It is described as somewhat terrestrial in its life, frequenting tangled thickets of vines, briars and brambles, and keeping itself very carefully concealed.

Food: Large black beetles and other insects (Wilson). Beetles, and berries of various kinds (De Kay). Spiders, and insects found among the thick shrubbery of brier patches and on the ground among the leaves (Samuels). Chiefly beetles and other insects, berries and other small fruits. It is said to be especially fond of wild strawberries (Brewer).

55. *MYIODIOCTES MITRATUS* (GM.), AUD. **HOODED FLY-CATCHING
WARBLER.** GROUP II. CLASS a.

As with the last, this is a southern species, probably to be found only along the lake shore, and there but rarely.

Food: Insects taken on the wing (Brewer). Winged insects (Wilson). Insects which it takes on the wing (De Kay).

56. *MYIODIOCTES PUSILLUS* (WILS.), BP. **BLACK-CAPPED FLY-CATCHING
WARBLER.** GROUP II. CLASS a.

This species is credited to North America at large, and regarded as common; yet it has not been my good fortune to meet with it. Nelson states that it is found along the borders of woods and about willow patches, and that it is a common migrant in Northeastern Illinois, May 7th to 25th, and the first of September. Since writing the above, one of these birds was picked up dead at River Falls after the cold wave of May, 1882, by which it had been killed.

57. *MYIODIOCTES CANADENSIS* (LINN.), AUD. **CANADA FLY-CATCHER.**
GROUP I. CLASS a.

This bird is chiefly a migrant in the United States. It is probable, however, that it breeds regularly in the northern portion of the state, as it does in Maine, for I obtained a young specimen, fully fledged, near Worcester, July 19, 1876. It was on the border of a cedar swamp flitting along among the lower branches of the hemlocks and pines which abound in that region. In the southern portion of the state, during the migrations, it frequents the densely wooded banks of streams. It is not common, at least in Central Wisconsin.

Food: Of three specimens examined, two had eaten flies; one, a hymenopterous insect; one, beetles; and one, larvæ.

Insects (Wilson). Insects taken on the wing (Samuels).

58. *SETOPHAGA RUTICILLA* (LINN.), SW. **AMERICAN REDSTART.** GROUP I.
CLASS b.

A few Redstarts breed in the southern part of the state, but the great majority pass northward, at least beyond Waupaca, to nest. During the last days of July or early in August, they become suddenly abundant and remain so until the middle of September, after which only loiterers are to be found. Its favorite haunts are the interior woodlands, both damp and dry, the wooded banks of

streams, and low, damp thickets. Groves, fence-rows and orchards are also visited by it frequently.

In its method of obtaining food, the Redstart is a fly-catcher of the most expert and vigorous sort, but its small size, its great dexterity, and its peculiar hunting grounds enable it to do a work quite distinct from that of the true Fly-catchers, even of the woodland species. Instead of stationing itself on the terminal branches where it can survey the openings between the tree-tops or command the fields above or below them, its peculiar field is within each particular tree-top, and here it plunges headlong through the branches, turning somersaults and performing such aerial movements in pursuit of its prey as only a Redstart can. It does beat out into the open air and plunge in hawk-like swoops to the ground, but these are its sports—its trespassings upon the rights of others. Its broad-based bill, and strong depending rictals, giving to the mouth, when open, the shape of a wide funnel, its keen vision, and its whole aerial outfit are adjusted to the gall-flies, leaf-miners, and other diminutive insects among which it lives, and upon which, I have no doubt, it feeds. Could it be induced to live in orchards, vineyards, gardens and parks, it would do there a work which the Pewee, the Least Fly-catcher and the Kingbird cannot. Mr. Samuels says that he has known a pair to build, and rear a brood, in a garden within five rods of a house.

Food: From the contents of eleven stomachs, examined collectively, were taken fourteen small beetles—some of them .09 of an inch long; four very small moths, four small hymenopterous insects—one, an ichneumon, and one, one of the *Proctotrypidæ*? .1 of an inch long; one heteropterous insect, .08 of an inch long, and a large number of dipterous insects, the majority of them less than one-tenth of an inch long. Three others had in their stomachs a single small larva each.

Winged insects (Wilson). Various insects and their larvæ (De Kay). Winged insects and larvæ (Audubon). Three specimens examined by Professor Forbes gave evidence of having eaten an ichneumon-fly, moths and caterpillars, beetles and leaf-hoppers.

FAMILY TANAGRIDÆ: TANAGERS.

FIG. 118.



LOUISIANA TANAGER (*Pyranga ludoviciana*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-nine Scarlet Tanagers examined.	29	Contained		Animal food..	
	4			Vegetal food..	
	7		15	Beneficial....	
	10		38	Detrimental...	
	25		94	Unknown.....	

Table showing the kinds and number of insects and spiders eaten by the Scarlet Tanager.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-nine Scarlet Tanagers examined.	4	Contained	4	Hymenoptera	
	8		26	Caterpillars ..	
	3		6	Diptera.....	
	17		47	Beetles	
	3		6	Hemiptera ...	
	4		7	Grasshoppers.	
	1		1	Dragon-fly....	
	3		11	Spiders	
	27		120	Adult forms..	
	8		26	Larvæ.....	
	1		1	Pupa	

59. PYRANGA RUBRA (LINN.), VIEILL. SCARLET TANAGER. GROUP I.

CLASS b.

This brilliant bird is very common with us, and breeds abundantly in groves and the borders of woodlands, and, occasionally, in orchards. These situations are also its usual haunts during the summer. In its choice of food and in its manner of obtaining it, the Scarlet Tanager is quite comprehensive. It is quite an expert fly-catcher, but, apparently, seizes only the larger winged insects. I have seen it beat out into a field, from the border of a piece of woods, and capture a butterfly (*Colias philodice*), which was flying ten rods distant. If proper breeding grounds are provided for it, I see no reason why it should not maintain a steady and considerable abundance, and prove itself a very useful bird. The

few berries which it occasionally eats are valueless compared with the service which it is capable of rendering.

Food: Of twenty-nine specimens examined, one had eaten ants; three, three ichneumon-flies, two of them *Thalessa lunator*?, the other a small species having an extent of wing of one-tenth of an inch; eight, twenty-six caterpillars; three, six diptera, three of them tipulids; seventeen, forty-seven beetles; three, six hemipterous insects; four, seven grasshoppers; one, a small dragon-fly; one, a very large spider; and two, ten harvest-men. Curculios, elaters and leaf-chafers, some of them three-fourths of an inch long, were represented among the beetles. From the stomachs of three young birds less than a week old were taken four caterpillars, one fly, one small grasshopper, one hemipterous insect, together with undetermined fragments.

Wasps, hornets, humble bees and other large winged insects; also, cherries, huckleberries and other fruits (Wils.). Insects found among tall cottonwood trees, and frequently a kind of bee found on laurea bushes (Cooper). Insects and their larvæ, preferring beetles, wasps, etc.; also, berries and grapes (De Kay). Insects (Samuels). Cherries, dogwood berries and cedar berries. Spends much of its time in pursuit of insects (Audubon).

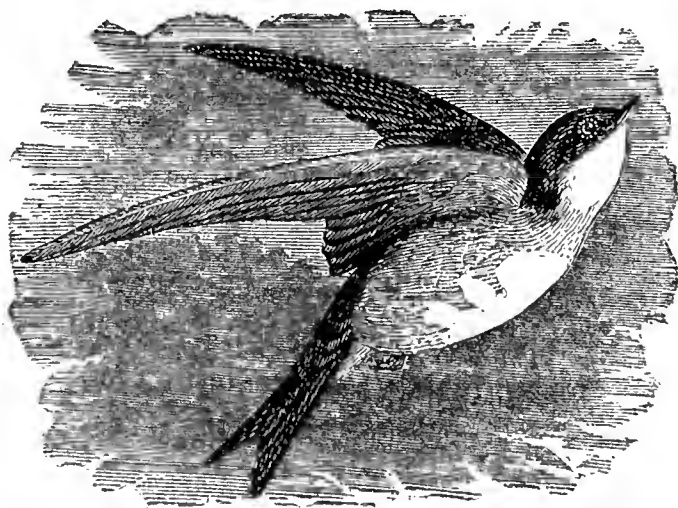
60. PYRANGA LUDOVICIANA (WILS.), BP. LOUISIANA TANAGER. GROUP
II. CLASS a.

Mr. Thure Kumlien informs me that he obtained a pair of these birds breeding near Busseyville, in May, 1877. The bird appears, however, to be out of place.

Food: Insects and berries (Cooper). The stomach of a specimen examined by Dr. Suckley contained insects, principally coleoptera, among them many fragments of a large *Buprestis*, found generally on the Douglas fir-trees (Coues).

FAMILY HIRUNDINIDÆ: SWALLOWS.

FIG. 119.



WHITE-BELLIED SWALLOW (*Iridoprocne bicolor*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects, spiders and mollusks taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of eleven Barn Swallows examined	11	Contained		Animal food.....	<div></div>
				Vegetal food	
	1		1	Beneficial	<div></div>
	4		35	Detrimental	<div></div>
	5		28	Unknown.....	<div></div>
Of fourteen White-bellied Swallows examined	14	Contained		Animal food.....	<div></div>
				Vegetal food	
	6		33	Beneficial	<div></div>
	9		68	Detrimental.....	<div></div>
	7		62	Unknown.....	<div></div>
One Eave Swallow examined.....	1	Contained		Animal food.....	<div></div>
				Vegetal food	
	1		2	Beneficial	<div></div>
	1		19	Detrimental.....	<div></div>
	1		6	Unknown.....	<div></div>
Of five Purple Martins examined	5	Contained		Animal food.....	<div></div>
				Vegetal food	
	5		28	Beneficial	<div></div>
	2		2	Detrimental.....	<div></div>
	3		12	Unknown.....	<div></div>

Table showing the number and kinds of insects, spiders and mollusks eaten by the Swallows.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of fourteen White-bellied Swallows examined	5	Contained	5	Hymenoptera	<div></div>
	3		10	Diptera.....	<div></div>
	13		63	Beetles	<div></div>
	3		23	Hemiptera	<div></div>
	2		2	Grasshoppers	<div></div>
	6		33	Dragon-flies	<div></div>
	1		1	Spider.	<div></div>
	14		142	Adult forms.	<div></div>

Table showing the number and kinds of insects, spiders and mollusks eaten by the Swallows — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of eleven Barn Swallows examined.....	7	Contained	14	Moths	
	7		40	Diptera.....	
	2		6	Beetles	
	1		1	Dragon-fly ...	
	11		68	Adult forms.....	
One Eave Swallow examined.....	1	Contained	2	Ichneumon	
	1		7	Diptera.....	
	1		6	Beetles	
	1		12	Leaf-hoppers.....	
	1		27	Adult forms.....	
Of five Purple Martins examined	3	Contained	14	Bees.....	
	2		8	Tiger-beetles	
	2		2	Butterflies	
	3		9	Breeze-flies	
	3		6	Dragon-flies	
	1		3	Mollusks	
	5		42	Adult forms.....	

61. HIRUNDO ERYTHROGASTRA HORREORUM (BARTR.), COUES. BARN SWALLOW. GROUP I. CLASS b.

The Barn Swallow, familiar as it is in most thickly settled districts, for which it has abandoned its native haunts to obtain dryer and securer breeding places, nowhere receives that attention and encouragement which it merits. The trim, tasty barns, so fast supplanting the old oaken excuses, intentionally exclude the Swallow in almost every case; even the projecting rafters under the generous eaves are so smoothly cased as to preclude a foothold for the birds. There is nothing out of the way in a tight, tasty barn, but it should make special provision for both the Barn and Eave Swallows. The trifling litter which they may produce in the barn is nothing when compared with the service they render, nor the half of what is often freely permitted from poultry. He who excludes them because of their twitter must be irritable indeed. Generous swallow-holes should be made in the gables. If brackets, designed with a view to their adaptability to birds, were put up under the broad eaves, they would serve the double purpose of ornamentation and utility. Robins, Pewees and Chipping Sparrows are all learning the inaccessibleness of such places to cats and other enemies, for I have found their nests in such situations, and Eave Swallows could certainly secure their nests much more readily if such provisions were made.

One great advantage of the Barn Swallow, and of all of them in fact, as a bird to be encouraged in agricultural districts, is its independence of woodlands

and groves, which must necessarily grow smaller and fewer as land increases in value. Again, their strong power of flight enables them to remain persistently upon the wing for hours at a time, and thus to do in the open fields, away from fences and trees, what other fly-catching birds are not able to accomplish. I have seen a squad of these birds follow a horse-rake back and forth across a stubble, apparently catching insects which were frightened into the air by the rake. They often hover about a flock of sheep, either to capture the flies which trouble them, or the insects which they startle while feeding. As the Swallow feeds to a considerable extent upon small dipterous insects and upon moths, we may expect to learn by careful study, that the Hessian fly and the clover-moth, which flies to some extent during cloudy weather, are destroyed by it in considerable numbers, as well as allied forms which affect similar situations.

Food: Of eleven Barn Swallows examined, seven had eaten fourteen small moths; seven, forty diptera, among which were thirty-three tipulids (*Pachyrhina ferrugina* ?); two, six beetles; and one, a small dragon-fly.

Insects (Cooper). Destroys numerous noxious winged insects (De Kay). Of two specimens examined by Prof. Forbes, each had eaten hymenoptera; one, leaf-chafers; one, diptera; one, hemiptera; and one, dragon-flies.

62. IRIDOPROCNE BICOLOR (VIEILL.), COUES. WHITE-BELLIED SWALLOW.
GROUP II. CLASS a.

This Swallow is perhaps more abundant than the last species, and during the fall it often collects in very large flocks. By the middle of September, nearly all have left for the South. Early in the summer they are most abundant along the borders of streams and reedy lakes, especially where dead trees abound, in the hollow limbs and trunks of which they breed. In July and August they spread out over fields, pastures and meadows, oftenest in damp situations not far removed from water. During September they affect all open situations. In Eastern Massachusetts this species is said to have undergone a complete change in breeding habits. There it now breeds almost exclusively in martin-houses, and any sheltered and accessible box appears to answer their purpose. In Massachusetts, too, they are most abundant in cities, while in sparsely settled districts they shun dwellings almost entirely.

It is said that during the breeding season this Swallow is somewhat quarrelsome, and even aggressive. Audubon knew of a pair driving the Barn Swallow from its nest and taking possession of it, but this act Dr. Brewer regards as exceptional. The change of habits which this species is undergoing in the East, suggests an apparently ready means of giving it a general distribution and considerable abundance with us, should this be desirable. I have no doubt that, if houses were put up along the fences about the fields, in a few years these birds would take possession of them and become much more abundant than they are at present. Further study of their food appears to be necessary, however, before such steps should be advised. The small species of dragon-flies to which these birds are apparently so destructive are very abundant in grain fields and meadows, especially those that are low and not far from standing or running water. It is known that these insects are predaceous, and a careful study of their food may show that they are very serviceable in holding in check such small insects as the wheat-midge and Hessian fly. This swallow, however, it will be seen, stoops to capture plant-lice and dipterous insects just as small as the wheat-midge. Another very valuable trait in this species is its apparent destructiveness to weevils — insects so many of which are injurious.

Food: From two stomachs were taken sixteen small dragon-flies, seven weevils, all *Brevirostres*, three rove-beetles, one other beetle, two hymenopterous insects, one belonging to the *Evaniidæ*, the other having an extent of .22 of an inch, three winged aphidæ, and one dipterous insect equal in size to the wheat-midge. In the stomachs of two others were found five weevils, five lamellicorn beetles, four small dragon-flies, one heteropterous insect belonging to the tribe *Obsculta*, and two winged ants. Two other specimens had eaten nineteen winged aphidæ, five small dragon-flies, nine small beetles, among them a click-beetle (*Elatér hieroglyphicus*), a weevil and a lamellicorn beetle, and two ichneumon-flies. Of ten other specimens examined, six had eaten beetles; two, small grasshoppers; and one, only dipterous insects, among them crane-flies.

In the fall, principally myrtle-berries (Wilson). Insects and myrtle-berries (De Kay).

63. PETROCHELIDON LUNIFRONS (SAY), CAB. **CLIFF SWALLOW; EAVE SWALLOW.** GROUP I. CLASS b.

The Eave Swallow is not uniformly distributed throughout the state, but in certain localities it is abundant. In Jefferson or Walworth county I have never met with them, but in Green Lake and Waupaca they are common. As many as twenty-five nests, nearly all occupied, have been counted under the eaves of a single barn. They affect, chiefly, dry upland fields, where they skim about over wheat fields and meadows. They may frequently be seen sweeping close to the ground over a freshly cut piece of clover before the grass has been taken up, often dipping into the grass for insects.

Food: From the stomach of a specimen shot while skimming over a field of wheat were taken twelve leaf-hoppers, a green and brown species, seven dipterous insects, one of them a large crane-fly, six small beetles, and two medium-sized ichneumon-flies.

Dr. Cooper states that he has seen this species catching small grasshoppers when they were swarming on a dry hillside. Of five specimens examined by Prof. Forbes, four had eaten hymenoptera, ants, wasps, ichneumons; five, beetles, ground-beetles, Nititulidæ, fungus-beetles, rove-beetles, leaf-chafers, curculios and long-horns; one, diptera; and two, hemiptera.

64. COTYLE RIPARIA (LINN.), BOIE. **BANK SWALLOW.** GROUP II. CLASS a.

The Bank Swallow still clings to its ancient breeding habits, and places its nest in burrows made in sandy banks and cliffs, usually adjacent to streams or lakes, but sometimes where a stone quarry has been opened. Its distribution is, therefore, local during the breeding season, and determined by suitable breeding places. It is social in its habits, and a hundred families often breed together in a single bank. Wilson states that the Crow sometimes watches at the entrance to their nests for the young birds when they emerge.

Food: Small hymenopterous insects, which they take on the wing (De Kay).

65. STELGIDOPTERYX SERRIPENNIS (AUD.), BD. **ROUGH-WINGED SWALLOW.** GROUP II. CLASS a.

A single specimen of this species was taken while skimming about over Fox river at Berlin, May 2, 1874. It was in company with a dozen more Swallows, probably of the same species. It is apparently uncommon here, and Mr. Nelson

cites it as a rare summer resident in Northeastern Illinois. It is quite similar in habits to the last species, in company with which it sometimes nests. It is said to enter towns occasionally, and to build its nest under the eaves and in holes in old walls.

Food: The single specimen examined had eaten only small beetles.

66. PROGNE SUBIS (LINN.), Bd. PURPLE MARTIN. GROUP II. CLASS a.

This species, so common, familiar, and confiding, is quite as general a favorite as any bird we have; how justly, however, recorded facts, so far as I know them, do not warrant an assertion. Apiarists enter severe complaints against it, and with some justice, as my own notes indicate. But its injuries are not confined to the destruction of bees. Dragon-flies, tiger-beetles, and predaceous wasps and flies are destroyed by it, apparently in large numbers. These insects are, presumably, as beneficial, so far as the character of their food is concerned, as any purely insectivorous bird can be.

Let us suppose that, during the first one hundred days of the Martin's stay with us, it destroys on an average, besides noxious insects, three insects per day, each as beneficial as a tiger-beetle. The entire destruction, during the time, would be three hundred individuals. Allowing each insect to lead an average active life of thirty days, and to destroy insects at the rate of three per day, 27,000 insects would represent the aggregate destructiveness of the three hundred individuals. It would, therefore, be necessary for the Martin to consume noxious insects at the rate of two hundred and seven per day for one hundred and thirty days, to recompense the services of these insects.

It is Dr. Brewer's opinion that the Martin is, on the whole, very beneficial, and were it only destructive to bees, there could be no doubt that his views are correct. As it is, the few definite facts which we have must be held until many more can be placed with them before final conclusions can be reached. It should be said that the destructiveness of this species to bees is not confined to those birds which chance to breed near the hives. The four young birds from which the following notes were obtained were bred in a martin-house which stood fully two miles from any hive, and there was no extensive apiary in the neighborhood.

Food: In the stomachs of four young birds about eight days old were found respectively, (a) two butterflies (*Colias philodice*, and a skipper), six honey-bees and many bits of shells of small mollusks; (b) two large dragon-flies, a large bee-fly, two honey-bees and bits of shells of small mollusks; (c) one large dragon-fly, three honey-bees, and fragments of the shells of small mollusks; (d) two medium-sized dragon-flies, one honey-bee, and small pieces of shells. Another young bird, which had recently left the nest and was being fed by its parents, had in its stomach the remains of seven tiger-beetles (*Cicindela vulgaris*), with a few minute fragments of insects. As an offset to the above, Packard states: "When a storm prostrated a martin-box, one of its compartments was found literally packed with the dried remains of the little yellow and black squash beetle."

Large beetles — among them the Goldsmith beetle, — wasps and bees (Wilson). Various winged insects, as wasps, bees, and large beetles (De Kay). Large numbers of bees (I. L. Hersey, Am. Nat., Vol. VII, p. 434). The larger kinds of insects, especially beetles (Brewer).

FAMILY AMPELIDÆ: WAXWINGS.

FIG 120.

CEDAR WAXWING (*Ampelis cedrorum*). From Tenney's Zoology.

67. AMPELIS GARRULUS, LINN. BOHEMIAN WAXWING. GROUP II. CLASS a.

An irregular winter resident, often appearing in large flocks.

Food: Berries of the mountain ash, the hawthorn and the ivy; it also feeds on insects, catching them on the wing as dexterously as a Flycatcher (Brewer). Juniper berries (Samuels). Chiefly insects and berries (Cooper). Juniper berries (E. W. Nelson).

68. AMPELIS CEDRORUM (VIEILL.), BD. CEDAR WAXWING; CHERRY BIRD.
GROUP I. CLASS b.

The Cedar Bird, like the last species, leads a wandering life, but unlike that bird, it is a common summer resident. It is also one of the earliest birds that reaches us in the spring, sometimes arriving in February. As yet, with us, it is confined principally to wooded districts until after the breeding season, but it does occasionally nest in orchards and villages. Late in July or early in August they unite in small squads, composed of two or three families, and rove here and there about the country. It is an exceedingly hardy and voracious bird, and for this reason has become adapted to a wide range of food. During the spring and early summer they are said to feed almost exclusively upon insects, and my own notes prove that during the last of July and August they feed to a considerable extent upon them. They are dexterous fly-catchers, and when in the woods they labor in a field almost peculiar to themselves. There they often station themselves on the topmost branches of some dead tree-top which commands a view above the forest, and there watch hours together for insects, every few minutes beating off and up into the air to secure the winged forms that are passing above them. On the borders of woods they often beat out into the fields, six or more rods, for passing insects. Besides being fly-catchers, they search much among the foliage of trees for larvæ of various kinds.

Notwithstanding the many times this handsome bird has been sentenced to extirpation because it is especially fond of cherries, the justice or injustice of such decisions yet remain to be established. And this leads me to suggest that it may yet be found advisable for farmers to plant cherry trees for the express purpose of attracting birds about their premises. Many of our Western farmers are not only scrupulously careful to cut down every tree that may be grow-

ing in their fields, but they are often equally careful to grub out those that remain along the fences. In view of the great service which insectivorous birds render to agriculture, and the conditions which must be observed in order to retain them in abundance in agricultural districts, the destruction of trees to which I have referred must be looked upon as false economy. There are very few of our birds which can or will withstand the piercing rays of the mid-summer noon-day sun, unprotected by shade of some sort; and a still smaller number of the insectivorous species which are so common and useful now can possibly remain after the groves and woods are gone, unless some special provisions are made for them.

The planting of shade-trees along the streets, which so many are now doing, is a step in the right direction; and the setting of trees along "line-fences," which a few on the prairies are attempting, is still more to the point. I believe that nearly every *stationary* fence on the farm should have its row of *deep-rooting* shade-trees; and especially should this be the case on the prairies, where there are so few attractions for birds. It need only be added, in urging this point, that scientific men have earnestly advised long ago this planting of trees for other purposes. In clearing farms in the future, much labor and expense may be saved by reserving such trees as are already growing where they are needed. I have said that it may yet be found advisable to plant cherry trees for the purpose of attracting birds. The place for them would be along the fences, where they could serve not only as shade and to draw the birds into the fields, but at the same time enable certain species to maintain a greater abundance. A more careful survey of the questions involved, however, is needed before such steps can be advised unhesitatingly.

Food: Of fifteen specimens examined, all but two had eaten cherries; two, raspberries; and two, red elder-berries. One had eaten five ichneumons (?); two, three beetles; one, three crickets; one, four tipulids; one, fifty tipulid eggs; one, two lace-wings; and one, a caddis-fly.

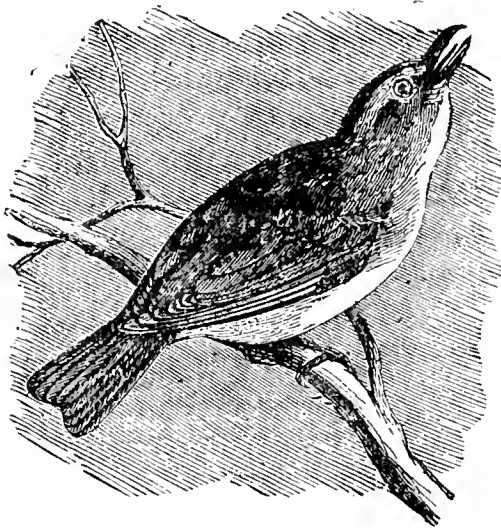
Whortleberries, berries of sour gum, red cedar-berries, cherries, and a few beetles and other insects (Wilson). Myrtle-berries (Cooper). Cherries, small beetles, canker-worms, and other caterpillars (De Kay). Cherries and caterpillars (Samuels). Caterpillars, beetles, canker-worms and various insects. It more than pays for the cherries it eats (Nuttall). They are, by preference, eaters of berries and other vegetable food, except in the spring and early summer, when they eat insects almost exclusively, feeding upon the larvæ of the spanworms and canker-worm and small caterpillars, by supplying these to their young (Brewer). Wilson, speaking of its food in the South, says: "Berries of red cedar, myrtle, holly, Cassine shrub, many species of smilax, together with gumberries, and a profusion of others with which the luxuriant swampy thickets of those regions abound, furnish them with a perpetual feast." He also states that they feed upon winged insects, of which they are very fond and remarkably expert at catching.

How destructive these birds are to caterpillars, at times, is shown conclusively by Prof. Forbes in one of his excellent reports on the food of birds. He says, in discussing the food of some birds which were collected in an orchard, severely attacked by canker-worms, in May, 1881: "Next comes the gem of our ornithological beauties, the Cedar-bird, sometimes called the Cherry-bird, and greatly persecuted for its love of cherries. A flock of about thirty had apparently taken up their residence in this orchard. The food record of the seven which were killed is very brief — canker-worms one hundred per cent. expressed it all. The number of canker-worms in each stomach, determined by

actual count, ranged from seventy to one hundred and one, and was usually nearly one hundred. Assuming that these constituted a whole day's food, the thirty birds were destroying three thousand worms a day, or ninety thousand for the month during which the caterpillar is exposed."

FAMILY VIREONIDÆ: GREENLETS.

FIG. 121.



RED-EYED GREENLET (*Vireo olivaceus*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders contained in the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of forty-nine Red-eyed Vireos ¹ examined ..	47	Contained		Animal food.....	<div></div>	
	14			Vegetal food	<div></div>	
	6		8	Beneficial	<div></div>	
	37		145	Detrimental.....	<div></div>	
	32		116	Unknown.....	<div></div>	
Of sixteen Warbling Vireos examined....	16	Contained		Animal food.....	<div></div>	
				Vegetal food	<div></div>	
	1		1	Beneficial	<div></div>	
	10		41	Detrimental.....	<div></div>	
	5		11	Unknown.....	<div></div>	
Of twenty-one Yellow-throated Vireos examined	21	Contained		Animal food.....	<div></div>	
				Vegetal food	<div></div>	
				Beneficial	<div></div>	
	13		25	Detrimental.....	<div></div>	
	13		55	Unknown.....	<div></div>	

¹ Scale reduced one-half for the Red-eyed Vireo.

Table showing the kind and number of insects and spiders eaten by the Vireos.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of forty-nine Red-eyed Vireos ¹ examined....	5	Contained	21	Hymenoptera ...	
	32		59	Lepidoptera.....	
	4		9	Diptera.....	
	15		32	Beetles	
	5		71	Hemiptera	
	5		6	Grasshoppers	
	4		5	Neuroptera	
	2		2	Spiders.....	
	39		212	Adult forms.....	
	1		1	Pupa	
Of sixteen Warbling Vireos examined	33	Contained	56	Larvæ.....	
	3		30	Insect eggs.....	
	8		34	Caterpillars.....	
	2		5	Beetles	
	3		3	Hemiptera	
	2		5	Diptera	
	1		1	Grasshopper	
Of twenty-one Yellow-throated Vireos examined	6	Contained	29	Adult forms.....	
	8		34	Larvæ	
	2		28	Insect eggs.....	
	7		19	Lepidoptera	
	2		12	Diptera.....	
	8		18	Beetles	
	2		2	Heteroptera.....	
	3	Contained	3	Grasshoppers.....	
	16		58	Adult forms	
	5		22	Larvæ	
	2		30	Insect eggs.	

69. VIREO OLIVACEUS (LINN.), VIEILL. RED-EYED VIREO; RED-EYED GREENLET. GROUP I. CLASS b.

No Vireo in Wisconsin is as numerous, and no summer resident of the woodlands as abundant as this species. The depths of deciduous forests, the outskirts of swamps, low damp woods, and thick groves of young trees are its usual haunts; occasionally it enters orchards, gardens and the shady portions of villages, but these it generally leaves to its cousin the Warbling Vireo. The greater portion of its food is taken from the foliage of trees and shrubs while at rest,

¹ Scale reduced one-half for the Red-eyed Vireo.

but it often pursues and captures on the wing the moths and other insects which it startles from their hiding places beneath the leaves. A departure from its usual habits leads it occasionally from the woods and groves into adjoining wheat-fields, where it feeds upon chinch-bugs. This departure is a very desirable one, but it is doubtful whether, even with a generous planting of shade-trees, this species can become sufficiently abundant to render any appreciable service in this direction, but its ability to render service in other directions is very great. It is almost exclusively insectivorous and particularly fond of caterpillars, both naked and hairy, and other larvæ. These birds are often the foster parents of the Cowbird.

Food: From the stomachs of eighteen of this species were taken fifteen caterpillars, five other larvæ; eight beetles—among them five weevils, one long-horn and one darkling beetle; seventy heteropterous insects—among them sixty-seven chinch-bugs; sixteen winged ants, one ichneumon (?), five dragon-flies, two dipterous insects—one of them *Tabanus atratus*; three small moths, two grasshoppers, one aphid, one chrysalid, two spiders, and seven dogwood berries. Of thirty-six other specimens examined, fifteen had eaten caterpillars; two, other larvæ; nine, beetles—among them two *Coccinella mali*; three, grasshoppers; two, ants; two, moths; four, insects, none of which were identified; and seven, fruits or seeds, among which were raspberries, dogwood berries, berries of prickly ash and sheep-berries.

Insects and berries (De Kay). Caterpillars, noxious larvæ and winged insects (Samuels). Canker-worm (Maynard). Caterpillars (Forbes).

70. VIREO PHILADELPHICUS, CASS. **BROTHERLY-LOVE VIREO.** GROUP II.
CLASS a.

Mr. Kumlien is said to have been familiar with this little-known species since 1849, and to have taken specimens of it every year since that period. Mr. Nelson also speaks of it as a common migrant in Northeastern Illinois between May 15th and 25th and September 5th and 25th. It has not been my good fortune to obtain it, and I am confident that I have not mistaken it for the next species. It is not known to stay with us during the summer, and its nest and eggs are unknown.

71. VIREO GILVUS (VIEILL.), BP. **WARBLING VIREO; WARBLING GREEN-LET.** GROUP I. CLASS b.

This species is a common summer resident, arriving about the 10th of May and retiring again by the 20th of September. So far as its favorite haunts are concerned, it is the exact counterpart of the Red-eyed Vireo, the shaded streets of cities, nurseries, orchards and the vicinity of dwellings being its favorite resorts. It also frequents the willow clumps of marshes and groves, but is rarely seen in the depths of the forests. It is, therefore, peculiarly adapted to thickly settled districts, and when properly protected and encouraged it may be expected to become abundant. The character of its food and its method of obtaining it are similar to those of the Red-eyed Vireo. No abundance which it is likely to assume can cause it to become injurious, and a pair of these birds breeding in an orchard are to be guarded with the same care as the choicest tree.

Food: Of sixteen specimens examined, eight had eaten thirty-four caterpillars; two, five beetles, among which were a lady-bird (*Coccinella 9-notata*), and a (*Diabrotica duodecim-punctata*); three, three heteropterous insects; two, two crane-flies; one, grasshoppers; two, twenty-eight insect eggs; and one, dogwood berries.

Caterpillars and winged insects (Wilson). Caterpillars and various seeds and berries (De Kay). Small black caterpillars which infest the poplars of streets (Audubon). Caterpillars and diptera; larvæ of carabidæ, the vine-chafer and long-horned beetles (Forbes).

72. VIREO FLAVIFRONS, VIEILL. **YELLOW-THROATED VIREO; YELLOW-THROATED GREENLET.** GROUP I. CLASS a.

This Vireo is also a summer resident, and quite as numerous as the last species. Its haunts, with us, are somewhat intermediate between *olivaceus* and *gilvus*, but approaching closer to the former. In the Eastern States, however, its haunts are more nearly those of the Warbling Vireo. In regard to this point Dr. Brewer says: "I have found none of this genus, not even the *gilvus*, so common in the vicinity of dwellings, or more familiar and fearless in its intercourse with man. All its nests that I have ever met with have been built in orchards and gardens, and in close proximity to dwellings." It has been said to seek its food chiefly among the upper branches of trees. My experience has been to find it more commonly feeding low down, and especially among the under-brush. It even searches about old brush-piles for beetles. It is a stronger, coarser natured bird than any of the preceding, and appears to feed less upon caterpillars; but it promises to become quite as useful as *gilvus*.

Food: Of twenty-one specimens examined, seven had eaten caterpillars — among them geometers; seven, beetles — among them weevils and a Buprestis; three, grasshoppers; two, moths; two, heteropterous insects — among them leaf-hoppers; three, dipterous insects.

Principally winged insects (Wilson). Caterpillars, small moths, wild bees and wasps (Audubon). Chiefly insects; later in the season various small berries (Brewer). Moths, caterpillars, diptera (Forbes).

73. VIREO SOLITARIUS, VIEILL. **SOLITARY VIREO; SOLITARY GREENLET.** GROUP I. CLASS a.

This bird is an uncommon bird wherever I have collected, and I have obtained it only in May and September. Low, damp woods, and the thickets bordering streams are some of its haunts. Mr. Nelson speaks of it as abundant during the migrations, and found everywhere in woods and thickets in Northeastern Illinois. Dr. Brewer records an instance of a pair once nesting near his dwelling. This nest became the receptacle for two Cowbirds' eggs, which were removed. Subsequently, the nest was pillaged by the Black-billed Cuckoo.

Food: One specimen of three examined had eaten two caterpillars, one beetle and a hymenopterous insect.

Insects and berries (De Kay).

74. VIREO NOVEBORACENSIS (GM.), BP. **WHITE-EYED VIREO; WHITE-EYED GREENLET.** GROUP I. CLASS a.

Dr. Brewer states that this Vireo is one of the most common and one of the most widely diffused of its genus in all parts of the United States east of the Rocky Mountains, and that it breeds abundantly in the Northwestern States, Illinois, Iowa, and Wisconsin. The bird, however, must be rare in the places I have visited, for I have never met with it. Its usual haunts are said to be the wild, swampy, open grounds near the edges of woods, and where there are thickets of smilax, briars and wild vines.

Food: Insects and berries (De Kay). Canker-worm (Brewer).

FAMILY LANIIDÆ: SHRIKES.

FIG. 122.



WHITE-RUMPED SHRIKE (*Lanius ludovicianus excubiteroides*). After Baird, Brewer and Ridgway.

Tabular Summary of Economic Relations showing the name and number of specimens eating animal and vegetable food, and the number of insects, birds, mice and snails contained in the stomachs or killed by them, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of fifteen White-rumped Shrikes examined	15	Contained	Animal food..		<div></div>	
			Vegetal food .		<div></div>	
	7		8	Beneficial . .	<div></div>	
	13		42	Detrimental..	<div></div>	
	10		24	Unknown.....	<div></div>	

Table showing the kinds and number of animals killed or eaten by the White-rumped Shrike.

NUMBER AND NAME OF SPECIMENS EXAMINED.		CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of fifteen White-rumped Shrikes examined or observed	4	12	Lepidoptera ..	<div></div>
	2	11	Diptera.....	<div></div>
	9	18	Beetles	<div></div>
	5	22	Grasshoppers.	<div></div>
	2	2	Crickets	<div></div>
	3	6	May-flies	<div></div>
	2	4	Snails	<div></div>
	2	3	Birds	<div></div>
	2	2	Mice.....	<div></div>
	15	75	Adult forms.	<div></div>
	4	6	Larvæ.....	<div></div>

75. LANIUS BOREALIS, VIEILL. BUTCHER BIRD; NORTHERN SHRIKE.

GROUP III. CLASS b.

This bird is a regular winter visitor to Wisconsin, but not in large numbers. Early in October it reaches the pine barrens in the northern part of the state, and shortly after makes its appearance further south. During the winter they often visit corn-fields for mice, where they will hover over a wagon to seize the first mouse that runs out upon the snow from the shocks that are being removed. They are quarrelsome among themselves, decidedly rapacious, and the dreaded foes of smaller birds. Sagacious and wily, they imitate the notes of other birds to decoy them within reach, or remain concealed until their victims approach, when they pounce upon them unawares. Their audacity is so great that they have been known to enter dwellings to rob the canary cage of its inmates. They dart hawk-like upon their prey, with almost certain aim, and pursue it with rapidity and pertinacity through the thickets in which it seeks shelter. Mr. Tripp has witnessed this bird kill and bear off in its bill a Snowbird. Dr. Brewer speaks of a pair that visited the Boston Common, killing one or more English Sparrows on several successive days. Mr. Samuels has seen it fly into a flock of Tree Sparrows and kill three before they had dispersed. And August Fowler says they are the deadliest enemy of the Chickadee.

These observations, it should be observed, were made during the winter season, when a scanty supply of food doubtless makes the bird much more desperate than it is in its summer home, surrounded by an abundance of insects upon which it also feeds. There can be but little doubt, however, that even there the birds which it destroys would be more effective in destroying insects, if permitted to live, than it can be.

Food: Mice and beetles. Principally grasshoppers, some other insects and spiders, occasionally birds (Wilson). Mice, small birds and insects (Cooper). Small birds, mice, insects and their larvæ (Samuels). Snowbird (Mr. Trippe). English Sparrow (Brewer). Black-capped Chickadee (August Fowler). Field-mice and small birds (Dr. Hoy).

76. *LANIUS LUDOVICIANUS EXCUBITEROIDES* (Sw.), COUES. **WHITE-RUMPED SHRIKE.** GROUP III. CLASS b.

This bird is a common summer resident, but happily not very abundant. It is peculiarly a bird of open countries and frequents fields, pastures and meadows of both high and low lands. It possesses many of the traits of the last species, but is a smaller and weaker bird. Dr. Cooper has seen it kill a Sparrow, but he thinks that the occurrence is exceptional; and Mr. Ridgway found a Chimney Swallow which it had impaled on a thorn. He also saw one of these birds dash upon a canary bird cage, and when the frightened inmate thrust its head between the wires, the Shrike seized and tore it off with its powerful beak. I have seen four Robins together attempting to drive one of these birds from the vicinity of a nest of half-grown young; and the Shrike only shifted its position upon the limbs of the tree to face its enemies, until my gun brought it to the ground. A nest which was built in an apple tree, but recently abandoned, I found literally lined with the wing-covers and legs of three species of tiger-beetles.

Since writing the above there has come to my knowledge positive evidence of this species having killed three other birds. One of them was a canary bird which belonged to Mr. Thomas Martin, of River Falls. The bird was hung in its cage outside the door, where it was discovered by this Shrike and its head torn from its body. This spring, 1882, a pair of these Shrikes built their nest in an evergreen standing in the cemetery at River Falls. Mr. Harry Smith, while passing one morning, observed a Shrike flying toward the graveyard with a small bird in its mouth. He followed the Shrike and observed him fix his bird in the crotch of a limb and proceed to pick off the feathers. Very soon the Shrike tore off the head of its prey and ate it, after which another piece was removed, and this was carried to the nest and disposed of there. The remainder of the bird Mr. Smith carried away. Two days after this event I visited the scene described, in company with Mr. Smith, and we found in the tree where the bird had been torn in pieces, two short, sharp, stiff, dead limbs standing in two forks of other limbs which were on opposite sides of the same small burr oak. Each of these sharp stubs had been used as a spit, for both were coated with a thick layer of blood, to which were adhering small olive-green feathers, probably those of some Warbler. From this evidence and that of Mr. Smith, it is certain that this pair had killed at least two birds, and, judging from the thickness of the layer of blood, I suspect that more than two had been spitted upon them. On another tree in the vicinity of this Shrike's nest, we found another short, dead limb similarly situated which had been used in the same manner. It was thickly coated with blood, and to it were adhering the hairs of some mouse. We whittled these limbs and returned some days afterward to examine them, but they had not been soiled. Two birds and one mouse at least must have been destroyed by this pair of Shrikes while breeding in the place named. The nest had four young birds in it one week old at the time of our visit.

From what is here recorded it is evident that, wherever else this Shrike may be allowed to breed, it should not be tolerated about dwellings and orchards where small birds are so serviceable.

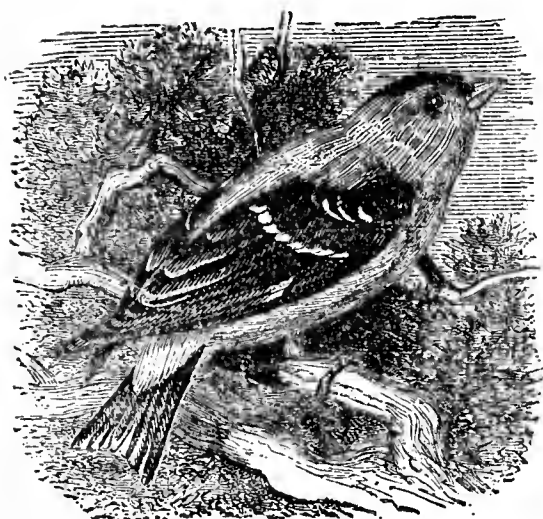
Food: Of fifteen specimens examined or observed, one had eaten seven moths; three, five caterpillars; two, eleven diptera, among them five crane-flies; nine, eighteen beetles, among them three ground-beetles, three carrion-beetles and two leaf-chafers; five, twenty-two grasshoppers; two, two crickets; three, six May-flies; two, four snails. Two had killed three birds — one, a Canary-bird, and

one, two Warblers; two, two mice. One of the birds was shot while in the act of killing a meadow mouse (*Arvicola riparia*).

It depends on grasshoppers and other insects (Cooper). Snakes, lizards and tree-toads (S. O. Gedney, Am. Nat., Vol. III, p. 160). Mice, young birds, and large insects (P. R. Hoy). Mr. Ridgway has found shrews, mice, grasshoppers, spiders, and, as stated above, a Chimney Swallow, spitted to the sharp thorns of the honey-locust.

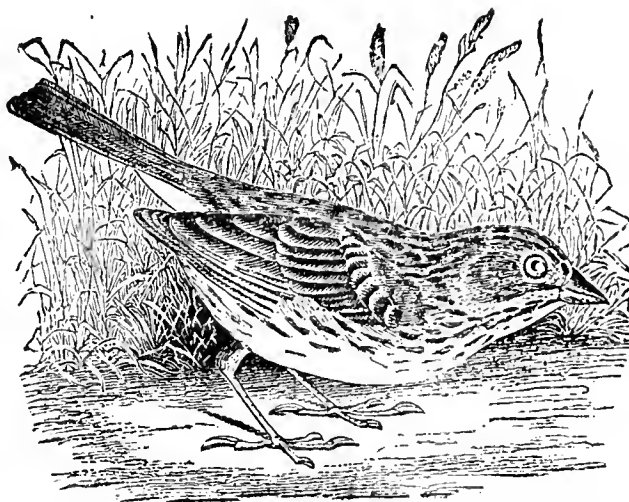
FAMILY FRINGILLIDÆ: FINCHES, ETC.

FIG. 123.



THISTLE-BIRD (*Astragalinus tristis*). After
B., B. & R.

FIG. 124.



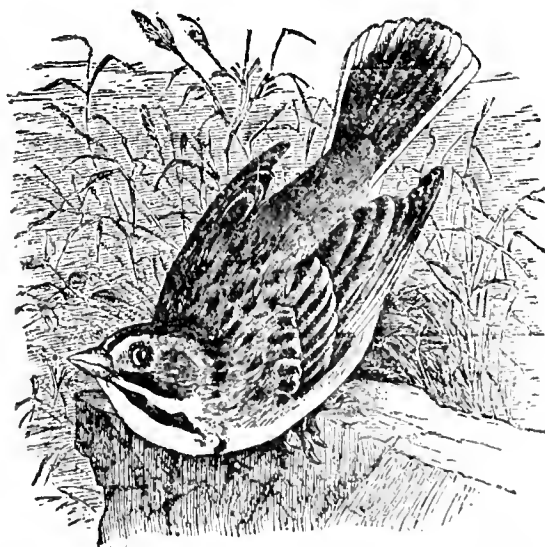
BAY-WINGED BUNTING (*Poocetes gramineus*).
After B., B. & R.

FIG. 125.



SONG SPARROW (*Melospiza fasciata*). After
B., B. & R.

FIG. 126.
































LARK FINCH (*Chondestes graminicus*). After
B., B. & R.

Tabular Summary of Economic Relations showing the name and number of specimens eating animal and vegetable food, and the number of insects, spiders, millipedes and snails taken from the stomachs, classified as to Economic Relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of nine Purple Finches examined	1	Contained		Animal food		
	8			Vegetal food		
	1		50	Detrimental		
Of two Red Crossbills examined		Contained		Animal food		
	2			Vegetal food		
Of thirty-four Thistle Birds examined	1	Contained		Animal food		
	33			Vegetal food		
	1		20	Detrimental		
Of six Lapland Longspurs examined		Contained		Animal food		
	6			Vegetal food		
Of ten Savanna Sparrows examined	2	Contained		Animal food		
	10			Vegetal food		
	1		2	Detrimental		
Of thirty-six Bay-winged Buntings examined	25	Contained		Animal food		
	34			Vegetal food		
	1		1	Beneficial		
	8		12	Detrimental		
	22		69	Unknown		
Of three Lincoln's Finches examined	3	Contained		Animal food		
	2			Vegetal food		
	3		10	Unknown		
Of twenty-five Swamp Sparrows examined	20	Contained		Animal food		
	13			Vegetal food		
	3		3	Beneficial		
	8		18	Detrimental		
	15		67	Unknown		
Of fifty-two Song Sparrows examined	30	Contained		Animal food		
	34			Vegetal food		
	5		10	Beneficial		
	9		22	Detrimental		
	27		71	Unknown		

Tabular Summary of Economic Relations of Finches—continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of eight Winter Snow-birds examined	2	Contained	Animal food	
	8		Vegetal food	
	2		4 Unknown.....	
Of fifteen Tree Sparrows examined.....	2	Contained	Animal food.....	
	15		Vegetal food	
	1		1 Beneficial	
	1		1 Unknown.....	
Of fifty-two Chipping Sparrows examined.	29	Contained	Animal food.....	
	27		Vegetal food	
	1		1 Beneficial	
	16		29 Detrimental	
	14		41 Unknown.....	
Of seven Field Sparrows examined.....	5	Contained	Animal food.....	
	6		Vegetal food	
	1		1 Beneficial	
	3		4 Detrimental	
	3		8 Unknown.....	
Of thirteen Clay-colored Sparrows examined.	10	Contained	Animal food.....	
	7		Vegetal food	
	4		13 Detrimental	
	7		22 Unknown.....	
Of sixteen White-throated Sparrows examined	6	Contained	Animal food	
	14		Vegetal food	
	3		5 Detrimental.	
	5		15 Unknown.....	
Of four Lark Finches examined		Contained	Animal food.....	
	4		Vegetal food	
Of three Fox Sparrows examined	1	Contained	Animal food.....	
	3		Vegetal food	
	1		50 Detrimental	

Tabular Summary of Economic Relations of Finches — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of eight Rose-breasted Grosbeaks examined	3	Contained		Animal food.....	
	8			Vegetal food	
	3		8	Unknown.....	
Of nineteen Indigo-birds examined.....	5	Contained		Animal food	
	18			Vegetal food.....	
	2		4	Detrimental	
	3		8	Unknown.....	
Of seventeen Marsh Robins examined....	11	Contained		Animal food.....	
	14			Vegetal food.....	
	1		1	Beneficial	
	5		12	Detrimental	
	8		19	Unknown.....	

Table showing the kinds and number of insects, spiders, myriapods and snails eaten by the Finches.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of nine Purple Finches examined	1	Contained	1	Caterpillar.	
	1		50	Plant-lice.....	
	1		50	Adult forms.....	
	1		1	Larve	
Of thirty-four Thistle-birds examined	1	Contain'd	20	Plant-lice.....	
	1		20	Adult forms.....	
Of ten Savanna Sparrows examined.....	1	Contained	2	Lepidoptera.....	
	1		1	Adult form.....	
	1		1	Larve	
Of thirty-six Bay-winged Buntings examined	3	Contained	8	Moths	
	1		3	Diptera.....	
	1		3	Ants.....	
	14		27	Beetles	
	4		4	Grasshoppers	
	1		3	Snails	
	17		72	Adult forms	
	4		10	Larvæ.....	
	1		8	Grasshopper eggs.	

Table showing the kinds and number of insects, spiders, myriapods and snails eaten by the Finches — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-five Swamp Sparrows examined.	2	Contained	2	Hymenoptera	
	6		14	Lepidoptera.....	
	3		3	Diptera.....	
	6		13	Beetles	
	2		2	Hemiptera	
	2		2	Grasshoppers	
	1		6	Snails	
	17		75	Adult forms	
Of fifty-two Song Sparrows examined.....	5	Contained	13	Larvæ.....	
	6		11	Lepidoptera	
	2		4	Diptera.....	
	9		25	Beetles	
	3		6	Hemiptera	
	4		5	Orthoptera	
	2		3	Neuroptera.....	
	1		1	Spider	
Of fifty-two Chipping Sparrows examined.	1	Contained	1	Millipede	
	29		75	Adult forms	
	10		17	Larvæ	
	3		4	Grasshopper eggs.	
Of seven Field Sparrows examined.....	1	Contained	2	Ants.....	
	1		12	Lepidoptera.....	
	1		1	Fly	
	4		9	Beetles	
	3		9	Hemiptera	
	6		8	Grasshoppers	
	1		1	Spider	
	11		59	Adult forms	
Of seven Field Sparrows examined.....	8	Contained	12	Larvæ.....	
	1		1	Caterpillar	
	1		1	Heteroptera	
	1		2	Grasshoppers	
	1		1	Spider	
Of seven Field Sparrows examined.....	5	Contained	12	Adult forms	
	1		1	Larve	

Table showing the kinds and number of insects, spiders, myriapods and snails eaten by the Finches — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirteen Clay-colored Sparrows examined	3	Contained	6	Beetles	
	3		12	Hemiptera	
	1		1	Grasshopper	
	10		34	Adult forms.....	
	1		1	Larve	
Of sixteen White-throated Sparrows examined	2	Contained	4	Caterpillars	
	2		4	Beetles	
	1		1	Grasshopper	
	1		1	Caddis-fly	
	6		16	Adult forms.....	
Of three Fox Sparrows examined	2	Contained	4	Larvæ.....	
	1		50	Chinch-bugs.....	
	1		50	Adult forms.....	
Of eight Red-breasted Grosbeaks examined.	2	Contained	7	Beetles	
	3		8	Adult forms	
Of nineteen Indigo-birds examined	1	Contained	2	Caterpillars	
	1		2	Beetles	
	1		1	Grasshopper	
	5		10	Adult forms.....	
	1		2	Larvæ.....	
Of seventeen Marsh Robins examined....	3	Contained	3	Hymenoptera	
	1		7	Moths	
	3		9	Beetles	
	4		5	Orthoptera	
	10		31	Adult forms.....	
	1		1	Larve	
	1		4	Walking stick eggs	

77. HESPERIPHONA VESPERTINA (COOP.), BP. **EVENING GROSBEAK.** GROUP **III.** CLASS **c.**

This is a winter visitant of somewhat irregular occurrence; at least in the southern portion of the state. During the winter of 1871 it is said to have been quite common.

Food: Seeds of the poplar, pine and spruce, the buds of Negundo, and the

leaves of various small plants (Cooper). Keys of the ash-leaved maple (Captain Blakinston). Seeds of pine and the larvæ of a large black ant (Brewer). Seeds of the sugar maple (Dr. Hoy).

78. *PINICOLA ENUCLEATOR* (LINN.), V. **PINE GROSBEAK.** GROUP II.
CLASS c.

The Pine Grosbeak, like the last species, is a winter visitant of irregular occurrence. Mr. Trippe states that it appears in Wisconsin about the middle of November, when it feeds on the buds and seeds of the alder, birch, etc., together with the seeds of weeds that abound on the prairies. During severe winters they are sometimes driven southward in great numbers into cities and about dwellings, in quest of food. During the winter of 1869-70, large numbers visited the coast of Massachusetts, and did considerable damage to the fruit buds of the apple and pear of that region.

Food: Buds of birch and willow (Wilson). Buds, berries and seeds of pines (De Kay). Seeds of white spruce (Richardson). Buds of apple and pear, and berries of red cedar (Brewer). Buds of poplar in the Yukon Territory (Mr. Dall).

79. *CARPODACUS PURPUREUS* (GM.), GRAY. **PURPLE FINCH.** GROUP I.
CLASS c.

This species is common during the migrations, and a few breed in the central part of the state. Mr. Nelson speaks of it as a winter resident in Northeastern Illinois, where it arrives the last of October. With us it makes its appearance early in September. At Ithaca, N. Y., it is a common summer resident, breeding in and about the city; and there, the Cowbird often deposits her eggs in its nest. Dr. Brewer states that one season no less than seven pairs of this Finch took up their abode in his yard. It is, therefore, fast assuming familiarity with man. As with the last two species, it is quite extensively a vegetable-feeder, and the character of its food is such as to bespeak for it some dangerous tendencies. It is often an unwelcome visitor to fruit-growers in Massachusetts, owing to its fondness for the blossoms of the apple, cherry, plum and peach. Mr. Samuels says that it is one of the few injurious birds of New England.

In a single instance, I saw one of these birds, early in the spring, feeding upon the fruit buds of an apple tree. It passed in succession from one bud to another, first picking the bud and slucking off the coarser scales, eating only the tender portion. There is another habit which this bird possesses, which I hope will be found to more than compensate for what injury it may do. It is that of destroying aphidæ. June 24, 1878, Mr. Trelease and myself observed one of these birds at work upon one of the small elm shade-trees on the campus of Cornell University, which was infested with a species of plant-louse that lives in colonies of a hundred or more on the underside of the leaves, causing them to curl backward so as to completely encase the plant-lice. The bird would turn its head sideways to the leaf and thrust its bill under its crumpled edge to extract the lice. We watched it pass to several leaves and rid them of their vermin in this manner; and the whole procedure was so direct and unhesitating as to leave no doubt in my mind that the practice was not a new one. It would even hang back downward in order to better get at the infested leaves.

Food: Seeds of the ironwood, and of various weeds and plants, buds of the apple, plant-lice, and caterpillars.

Seeds of poplar and button-wood and of many rank weeds, the blossoms of the elm and the stamens of the cherry and apple blossoms (Wilson). Buds and berries of evergreens in winter, in summer, insects (De Kay). Buds of trees, insects, and the tender parts of spruce cones (Audubon). Seeds, berries and buds (Cooper).

80. *LOXIA CURVIROSTRA AMERICANA* (WILS.), COUES. **AMERICAN RED CROSSBILL. GROUP II. CLASS a.**

During October and November of 1877 this species was very abundant all along the Flambeau river. They associated in flocks of considerable size and frequented the tops of the tallest trees. Occasionally small troops came down among the willows and alders along the banks of the streams. About the logging camps they are very familiar, often venturing in-doors when left open. In midsummer of 1868 the Crossbills appeared in great numbers in Western Maine, and there proved very destructive to the oats, disappearing again as soon as the harvest was over.

Food: Seeds of the white pine and of various plants.

Seeds of coniferous trees, other small seeds, and sometimes buds of trees (Cooper). Seeds of pines and firs, (Audubon). Seeds of pines, birches, etc. (T. M. Trippe). Seeds of coniferæ and other seeds (Brewer). Seeds of sunflower (Hoy).

81. *LOXIA LEUCOPTERA*, GM. **WHITE-WINGED CROSSBILL. GROUP II. CLASS a.**

This species, like the last, is probably a regular winter resident in Northern Wisconsin, but appears to be much less abundant. It scuds about in small troops, accompanied by a few of the Red Crossbills, and is also familiar about logging camps, where it comes for crumbs.

Food: Seeds and crumbs gleaned about dwellings.

Seeds of white spruce (Richardson). Canker-worm (Maynard).

82. *ÆGIOTHUS LINARIA* (LINN.), CAB. **RED-POLL LINNET. GROUP I. CLASS b.**

This familiar boreal species is an abundant winter resident, and while here it moves about the fields and pastures in flocks, gathering such seeds as it may find above the snow. Mr. Trippe states that, in Minnesota, the Lesser Red-poll appears in vast numbers, about the middle of October, and remains during the entire winter.

Food: Seeds of the common alder (Wilson). Seeds of various trees, as pine, birch, linden and alder (Cooper). Seeds of grasses, and of pine, also berries and buds (De Kay). Weed and grass seeds, and seeds of white birch (Samuels). Seeds of birch and pine, sometimes fruit-buds (Nuttall). Seeds of birch and alder. It also eats the buds of trees, and (when in flocks) proves in this way seriously injurious to young plantations (Selby, Brit. Birds). A maimed specimen which Dr. Kirtland kept in his greenhouse fed upon the aphidæ that infested his pelargoniums.

83. *ÆGIOTHUS EXILIPES*, COUES. **AMERICAN MEALY RED-POLL. GROUP II. CLASS a.**

This species enjoys a more northern habitat than the last, and is resident in Greenland. It is said to enter the United States in winter, passing as far south as Mount Carroll, Illinois.

84. *CHRYSOMITRIS PINUS* (BARTR.), BP. **PINE LINNET.** GROUP I. CLASS a.

This species is quite erratic in its movements, causing the time of its occurrence and its abundance to vary greatly. Ordinarily it is only a winter resident. A few may breed in the state. Mr. Trippe observed it in great numbers in the fall in Minnesota, and Mr. Jordan is said to have taken it in midsummer near Indianapolis. Evergreen forests are its favorite haunts, but those of deciduous trees, willow and alder thickets, fields and gardens are also visited by it. It is said to frequent apple orchards, at times, where it feeds upon plant-lice.

Food: Small weed and grass seeds.

Black alder and pine seeds (Wilson). Spruce, juniper, alder and willow seeds (Cooper). Pine and larch seeds (De Kay). Pine seeds (Samuels). Berries of sweet gum (Audubon). Seeds of grasses and weeds (Brewer).

85. *ASTRAGALINUS TRISTIS* (LINN.), CAB. **AMERICAN GOLDFINCH;
THISTLE-BIRD.** GROUP I. CLASS b.

This elegant little Finch is one of our most abundant birds, and, to a considerable extent, resident throughout the year. In its less showy winter dress, however, it is not so well known. Its almost universal distribution through the open fields, pastures and meadows, together with its tendency to unite only in small flocks, completely counteract the concentrating tendency of its gregarious nature, so that, practically, its effects are those of a bird which is not gregarious. Few birds are more completely graminivorous than it; but it feeds so extensively upon the seeds of noxious weeds that the little grain and garden seeds which it eats are but a just compensation for the service it renders. No class of seeds suit it so well as those of the Composite Family, which are readily hulled, and the service which the Thistle-bird renders in destroying the seeds of the almost uncontrollable Canada thistle, throughout the Eastern and Middle States, must be very great. With us it renders an equal service by destroying the seeds of the pasture thistle, and those of other troublesome weeds. Dr. J. M. Wheaton states that it feeds upon the Hessian-fly. I have seen it feeding upon the plant-louse mentioned in connection with the Purple Finch.

Food: Thistle, dandelion, burdock, bitter-weed and lettuce seeds, seeds of foxtail grass (*Setaria viridis*), and corn cockle, wheat, rye, and clover seed. Seeds of composite flowers in summer, and of cotton-wood and cockle-bur in winter (Cooper). Thistle, hemp, lettuce and salad seed (Wils.). Sunflower, lettuce and thistle seeds (De Kay). Seeds of various weeds and grasses (Samuels).

86. *PLECTROPHANES NIVALIS* (LINN.), MEYER. **SNOW BUNTING; SNOW-
FLAKE.** GROUP I. CLASS a.

This boreal, eminently terrestrial and gregarious species is an abundant winter resident. It makes its appearance late in October and retires early in April. They frequent cultivated fields in large flocks, and feed largely upon the seeds of troublesome weeds. Their terrestrial habits preclude their becoming injurious to the buds of trees.

Food: Seeds of black bind-weed, and foxtail grass (*Setaria viridis*).

Grass seeds, insects and small mollusks (De Kay). Seeds of various wild plants and small mollusks (Samuels). Larvæ obtained on the houses of Greenlanders (Brewer).

87. *CENTROPHANES LAPPONICUS* (LINN.), KAUP. **LAPLAND LONGSPUR.**

GROUP I. CLASS a.

This species, like the last, is a winter resident, terrestrial, and often occurs in immense flocks in stubble and corn-fields in quest of weed seeds.

Food: Each of six specimens examined had in their stomachs more than one hundred seeds of the pigeon-grass and black bind-weed.

Seeds of grasses and berries (De Kay). Seeds of Alpine arbutus (Richardson).

88. *CENTROPHANES PICTUS* (SW.), CAB. **PAINTED LARK BUNTING.**

GROUP I. CLASS a.

A winter resident. Not common. Terrestrial and gregarious. Frequents cultivated fields in quest of seeds.

89. *PASSERCULUS SANDVICENSIS SAVANA* (WILS.), RIDG. **COMMON SAVANNA SPARROW.** GROUP I. CLASS a.

A common migrant from the last of April to the middle of May, and again throughout September and the early part of October. They are especially fond of the marshy banks of streams and low pastures and meadows, but stubble and corn-fields are also visited by them, and occasionally they may be met with in hazel and willow patches. Nearly their whole time is spent upon the ground.

Food: Each of ten specimens examined had eaten small seeds; one had eaten one caterpillar, and one a moth.

Beetles and seeds of grass (De Kay). Beetles and seeds (Samuels).

90. *POESETES GRAMINEUS* (GM.), BD. **BAY-WINGED BUNTING; GRASS FINCH.** GROUP I. CLASS b.

A very abundant summer resident. Arrives early in April and remains until October. It spends most of its time upon the ground and feeds to some extent upon insects throughout the season. I estimate that fully one-third of its food consists of insects, and the remainder largely of seeds of noxious plants. The specimen mentioned below, which had eaten two kernels of wheat, and the one which had eaten a single kernel of rye, appear to have made an exceptional choice of food. Especial value attaches to the services of this species on account of its favorite haunts, which are cultivated fields, particularly the corn and grain fields. In these places it breeds, and rears from two to three broods each season, placing the nest upon the ground, often in a hill of corn.

Food: Of thirty-seven specimens examined, thirty-one had eaten various small weed seeds; five, four grasshoppers; one, eight grasshoppers' eggs; four, ten larvæ; fourteen, twenty-seven small beetles; three, eight moths; one, three flies; one, three land snails (*Helix*); one, two kernels of wheat; and one, a kernel of rye.

Insects and grass seeds (De Kay). Principally seeds of grasses and other plants and a few insects (Audubon).

91. *COTURNICULUS PASSERINUS* (WILS.), BP. **YELLOW-WINGED SPARROW.**

GROUP I. CLASS a.

In speaking of this species Dr. Brewer says: "The common Yellow-winged Sparrow appears to be a bird of irregular and unequal distribution, found in certain localities in great abundance and not seen in intervening districts." It has not been my fortune to meet with it in Wisconsin, but Dr. Hoy states that

it is not uncommon in the reedy sloughs on the prairies. Such haunts are different from those usually attributed to it by other writers.

It appears to be a somewhat southern species. Mr. Nelson in referring to it says: "One of our most abundant summer residents. Found everywhere in fields and on prairies, from the middle of May until the first of September." Its habits and economic relations appear to be very similar to those of the last species.

Food: Grass seeds and the larvæ of insects (Wilson). Insects and their larvæ, seeds of grasses and other plants (De Kay). Larvæ, insects, seeds, grasses and small weeds (Brewer).

92. *AMMODRAMUS CAUDACUTUS NELSONI* (ALLEN). **NELSON'S SHARP-TAILED FINCH.** GROUP II. CLASS a.

A single specimen of this recently discovered variety was obtained in the marsh on the border of Cold Spring Pond, September 7, 1877, and identified by Mr. Ridgway, through the kindness of Prof. Baird. Mr. E. W. Nelson thinks that it breeds in Northeastern Illinois, but that many pass to the north for the same purpose. Its usual haunts appear to be low, wet, reedy marshes.

93. *MELOSPIZA LINCOLNI* (AUD.), BD. **LINCOLN'S FINCH.** GROUP I. CLASS a.

This species is properly regarded as a migrant in Wisconsin, although a few are known to breed in the state. I have found it an uncommon bird, but Mr. Nelson speaks of it as common in Northeastern Illinois during the migrations. Two specimens were taken, September 26th, in company with *fasciata*, darting in and out of a hedge of rank weeds that grew along a corn-field.

Food: Seeds. One had eaten five case-bearing caterpillars (*Coleophora*); one had eaten three other insects. Insects and berries (Audubon). Seeds (Mr. Dresser).

94. *MELOSPIZA PALUSTRIS* (BARTR.), BD. **SWAMP SPARROW.** GROUP I. CLASS b.

This Sparrow is a summer resident and very abundant in its favorite resorts, which are the sedgy and reedy swales bordering streams, ponds and lakes. From these places it rambles off into the damp meadows to feed, but never far until it leaves for the south. A few frequent the open glades of tamarack swamps. It is insectivorous throughout the season, and but little more than one-half of its food consists of seeds. The bird is especially to be encouraged because it frequents, in part, those haunts where the troublesome army-worm breeds; and the three broods which it sometimes rears in a season necessarily make its destruction of insects very great. Audubon states that it forms the principal food of the Sparrow and Pigeon Hawks and of the Marsh Harrier, in certain localities, during some portions of the year.

Food: Of twenty Swamp Sparrows examined, two had eaten two parasitic hymenoptera — one a small ichneumon-fly and the other a chalcidian?; one, one moth; six, thirteen beetles; two, two hemiptera, one of them of the cicadellina, the other a plant-louse; two, two grasshoppers; and one, six snails. Five of the caterpillars eaten by two of the birds were case-bearers (*Coleophora*), and one of them a hairy arctian. Thirteen of twenty-five had eaten small seeds of grasses, sedges and other plants.

Grass seeds and aquatic insects (De Kay). Principally grass seeds, wild oats, and insects (Wilson). Old birds in the spring, and the young, largely insects, principally coleopterous forms. After the breeding season, when the young are able to take care of themselves, almost entirely seeds of coarse grasses and sedges (Brewer).

95. *MELOSPIZA FASCIATA* (GM.), SCOTT. **SONG SPARROW.** GROUP I.
CLASS b.

No Finch in Wisconsin is as abundant, and none of the summer residents arrive as early or tarry as late as this species. The borders of cultivated fields, and the fringing shrubbery of woodlands, groves and banks of streams are its favorite haunts; from these it sallies into the adjoining fields for food. They are particularly fond of the weedy hedges that often grow along neglected fences, and I am not sure but that these tangles so irritating to the thrifty farmer better be encouraged in the back fields rather than rooted out. Like the last species, it is insectivorous from its arrival until it leaves, and two if not three broods are reared each season. I have found the young unable to fly as late as September 6th.

Food: Of fifty-two specimens, twenty-nine had eaten a few or many seeds; one, two kernels of wheat; nine, twenty-five beetles — among them a lady-bird (*Coccinella tibialis*), several ground-beetles and lamellicorn beetles; four, five grasshoppers; three, four grasshopper's eggs; one, a moth; one, two dragon-flies; one, a cricket; one, a spider; one, a millipede; two, four dipterous insects; one, a heteropterous insect; and one, small fungi, chiefly insects (De Kay). Grass seeds, some berries, grasshoppers and other insects, some of which it takes upon the wing (Audubon). Caterpillars and other larvæ, and small moths. The canker-worm is a favorite article of food (Brewer). Seeds of weeds (Forbes).

96. *JUNCO HYEMALIS* (LINN.), SCH. **WINTER SNOWBIRD.** GROUP I.
CLASS a.

A very abundant migrant. A few summer in Northern Wisconsin. Weed-grown fields, the hedges along fences, the borders of groves and woods, and willow, osier and alder thickets are its favorite haunts, but it is much about dwellings and often enters villages. During their migrations these birds are almost exclusively graminivorous.

Food: Seeds of foxtail grass, pigweed, and occasionally an insect. Seeds (Wilson). Grass seeds, berries, grains and insects (De Kay). Small berries, seeds of grasses, and other small plants, insects and larvæ (Brewer). Seeds of weeds (Forbes).

97. *SPIZELLA MONTICOLA* (GM.), BD. **TREE SPARROW.** GROUP I. CLASS b.

But very few, if any, of this late migrant remain during the winter. Late in March and early in April they pass us northward. Woods, groves, the banks of streams, and the tall weed and willow patches of marshes, are its usual haunts. After the 16th of October, 1877, these birds became very abundant all along the Flambeau river, where they frequented the willow and alder thickets in small troops.

Food: Of fifteen examined all had eaten small seeds, one an insect, and one a spider. Beetles, hard seeds and berries (De Kay). Seeds of grasses and weeds (Samuels). Hard seeds, berries, beetles and mollusks (Audubon). Weed seeds (Coues). Beetles (Forbes).

98. *SPIZELLA DOMESTICA* (BARTR.), COUES. **CHIPPING SPARROW; HAIR-BIRD.** GROUP I. CLASS a.

No one of our native Finches has assumed such familiar relations with man as this species. It is constantly about dwellings in the summer, and it even presumes to place its nest, at times, on the brackets under the eaves of the porches, almost within hand's reach. Its services are especially valuable because it is so much on the ground, where it and the Robin, about dwellings and in orchards and gardens, are almost alone. During rainy days it may often be seen with a cut-worm in its mouth, and fully one-third of its food during the summer consists of insects of various kinds. So far as I know, it is harmless to garden seeds and never molests grains, while it feeds much upon the seeds of weeds. It nests in orchard trees and garden shrubs, among the branches of which it obtains a portion of its food, and is often doomed to become the foster parent of the heartless Cowbird. Marauding cats kill many of these birds, and, doubtless, prevent many more from nesting nearer dwellings. Properly constructed buildings and traps should make cats unnecessary.

Food: Of fifty-two specimens examined, twenty-seven had eaten small seeds; seven, ten caterpillars — among them a young *Sphinx* and three cut-worms; two, two moths; four, nine beetles; two, large winged ants; two, nine small heteropterous insects — among them seven individuals of the same species mentioned under the Tennessee Warbler; three, three dipterous insects; and two, two grasshoppers.

Small insects and seeds (De Kay). Canker-worm (Maynard). Canker-worm and other caterpillars and larvæ (Brewer). Moths, caterpillars, beetles, among them curculios; leaf-hoppers, Reduviidæ, grasshoppers and weed seeds (Forbes). It sometimes becomes a prey to the Sharp-shinned and Marsh Hawks and to the black snake (Samuels).

99. *SPIZELLA AGRESTIS* (BARTR.), COUES. **FIELD SPARROW.** GROUP I. CLASS a.

Not a very common summer resident. The borders of groves, hazel patches in pastures, the borders of woods and "clearings," and the hedges along field-fences are its usual haunts; from these it makes frequent excursions into the adjoining fields for food. It is sometimes two-brooded, and places its nest upon the ground or in trees or bushes. If it were more abundant it would be quite as serviceable in the fields as the Chippy is about dwellings.

Food: Of seven specimens examined, four had eaten small weed seeds; one, a caterpillar; one, two grasshoppers; one, a very small heteropterous insect; one, a harvest-man; and one, a spider. In the stomachs of two there were bits of insects, none of which were identified.

Caterpillars, beetles, hemiptera and the seeds of weeds. Tenebrionidæ among beetles (Forbes).

100. *SPIZELLA PALLIDA* (SW.), BP. **CLAY-COLORED SPARROW.** GROUP I. CLASS b.

Thirteen specimens which answered closely to descriptions of this species, and which differed markedly, it appeared to me, from *domestica* and *agrestis*, having been taken in Wisconsin — four in Green Lake, two in Waushara, and seven in Jefferson county, — and I have no doubt that my identification has been correct. They frequent the edges of groves and woods bordering dry fields, past-

ures with scattering trees, and occasionally they approach dwellings in company with the Chippy.

Food: Of thirteen specimens examined, seven had eaten small seeds; three, six beetles; one, a grasshopper; one, larvæ; two, eleven plant lice and other small hemipterous insects. Three had eaten insects, none of which are identified.

It feeds upon the buds of elms and other trees in the spring, in Iowa (P. M. Trippe).

101. *ZONOTRICHIA ALBICOLLIS* (GM.), BP. **WHITE-THROATED SPARROW.**
GROUP I. CLASS a.

This species is a migrant in the southern portion of the state, but from Wisconsin Valley Junction and Angelica northward it breeds in abundance. In its summer home it is partial to wind-fall tracts. In the fall they frequent the hedges along fences and other places where rank weeds abound. They are feeding their young as late as July 26th, from which it may be inferred that they rear two broods each season. It feeds mostly upon the ground, and, until after July, its food is largely insects.

Food: Of sixteen specimens examined, thirteen had eaten many or a few seeds; one, raspberries; one, a grasshopper; two, four caterpillars; two, four beetles; and one, a caddis-fly.

Seeds of rank weeds (Wilson). Seeds and insects (De Kay). Seeds, berries, and insects (Samuels). Caterpillars and seeds of weeds (Forbes).

It is killed by the Sparrow and Sharp-shinned Hawks, and especially by the Marsh Harrier (Audubon).

102. *ZONOTRICHIA LEUCOPHRYS* (FORST.), SW. **WHITE-CROWNED SPARROW.**
GROUP I. CLASS a.

Only a migrant in Wisconsin, so far as known at present, and it is much less numerous than the last. Its haunts and habits are similar to those of the last. Audubon states that in the fall it occasionally pursues insects on the wing.

Food: A single specimen examined had eaten weed seeds.

Seeds of weeds (Forbes). While in Labrador, beetles, grass seeds, a variety of berries, and small mollusks (Audubon).

NOTE.—A single specimen of var. *intermedia* of this species, and of *Z. coronata* and *Z. querula*, Dr. Hoy reports to have taken at Racine.

103. *CHONDESTES GRAMMICUS* (SAY), BP. **LARK FINCH.** GROUP I. CLASS a.

I have only met with this species at Berlin. There it arrives early in May, and is quite common. Several pairs bred on the ground in the park and in the school yard. It is a terrestrial species, though not exclusively so, and its favorite haunts are the open prairies. I am inclined to think that it sets off for the south early in July, for I have never seen it later. Since writing the above, I have found a species breeding regularly at River Falls.

Food: Four specimens, taken in May and June, had eaten only small seeds.

Seeds of grasses and other small plants (Brewer).

104. *PYRGITA DOMESTICA*, CUV. **ENGLISH SPARROW.** GROUP III.
CLASS b.

Within the last few years this European bird has been introduced into Milwaukee, and is rapidly becoming abundant in many of the towns and cities in the southern part of the state.

Without reviewing the flood of literature that has appeared during the past ten or fifteen years relating to the usefulness of this species, it will be sufficient to say that I believe it to be a bird for which we have no present need, and that it is positively in the way of a score of more useful species. The bird has very few of those qualifications, indeed, which are combined in good insect destroyers, while it has many traits that are positively vicious. One Chipping Sparrow is worth two score of these imported gamins.

105. *PASSERELLA ILLACA* (MERR.), SW. **FOX-COLORED SPARROW.**

GROUP I. CLASS a.

This elegant species is not a very common migrant. It passes us in the fall between the last of September and the first of November. During this time it frequents old "clearings," hazel and briar patches, and the rank weeds that grow along neglected fences. It is terrestrial in its habits, and obtains much of its food by scratching upon the ground among fallen leaves. One of these birds which was taken in a hazel thicket adjoining a wheat field in October, had its stomach distended with chinch-bugs. These pests had doubtless crawled in among the fallen leaves to hibernate; and the fact shows that a bird which never visits cultivated fields, and which is only a migrant, may nevertheless be directly beneficial to agricultural interests. It shows, also, that such birds should be protected, if possible, in their building haunts and in their southern homes.

Food: Three out of four specimens examined had in their stomachs nothing but small seeds of various kinds; the other had in its stomach more than fifty chinch-bugs.

Grass seeds and eggs of insects (Wilson). Seeds and insects (De Kay). Seeds and insects (Samuels). Hymenoptera, long-horn beetles, hemiptera and spiders (Forbes).

106. *SPIZA AMERICANA* (GM.), BP. **BLACK-THROATED BUNTING.**

GROUP I. CLASS a.

It has been my experience to find this an uncommon bird in Wisconsin. It is, at least, rare in places where it might be expected to occur in abundance. It has been taken in the spring at Whitewater and I have seen it in May at Berlin.

It breeds at Racine; and in Northeastern Illinois it is said to be common in some places and abundant in others. It is terrestrial in its habits and frequents orchards and cultivated fields, nesting in both situations. It is apparently a bird which we could wish to have much more abundant.

Food: Caterpillars, beetles, canker-worms and other destructive insects (De Kay).

Prof. Forbes, in his report on "Birds and Canker-worms," says of this species: "This was the most common bird in the orchard, and it was undoubtedly destroying great numbers of the worms. Again and again they were observed busily searching the leaves and apparently taking every worm as they went. . . . Eleven specimens were obtained, eight of which had eaten canker-worms, which made about half of the food of the whole number. Other measuring worms were five per cent., cut-worms seventeen per cent., coleoptera nine per cent. (about one-third of them Carabidæ), and snails seven per cent. A wild bee, an ant or two, a few scavenger beetles, curculios and seeds of pigeon-grass were also found."

107. *ZAMELODIA LUDOVICIANA* (LINN.), COUES. **ROSE-BREASTED GROS-BEAK.** GROUP I. CLASS b.

The Rose-breasted Grosbeak is a summer resident, but nowhere abundant, nor is it uniformly distributed throughout the state in apparently suitable localities. Its favorite resorts are the thickly wooded banks of streams, willow and alder thickets and high open woods. Groves and the shade-trees along roadsides are also visited by it. Prof. F. W. Bundy writes me that they often visit the potato patches in the vicinity of Sauk City in quest of potato beetles; and my friend F. H. Severance informs me that it is of frequent occurrence among the shade-trees on the college campus at Galesburg, Illinois.

Dr. Bachman, quoted by Audubon, makes the following notes concerning the food of one of these birds which he kept in confinement three years: "It fed readily on various kinds of food, but preferred Indian meal and hemp seed. It was also very fond of insects, and ate grasshoppers and crickets with a peculiar relish. It watched the flies with great apparent interest, and often snatched at and secured the wasps that ventured within its cage."

Food: Of eight specimens examined, six had eaten small seeds; two, seven beetles; and one, berries. Two had in their stomachs only finely comminuted vegetable material.

Berries of sour gum (Wilson). Sometimes buds of trees (Cooper). Grain, berries and insects (De Kay). Seeds of birch and alder, berries, buds and insects (Samuels). Tender buds of trees (Audubon). Potato-beetle (F. W. Bundy). Potato-beetle (H. H. Mapes, Am. Naturalist). Canker-worms, army-worms and other caterpillars, wood-boring, leaf-chafing and snout beetles, also hymenoptera and the seeds of weeds (Forbes).

108. *PASSERINA CYANEA* (LINN.), GRAY. **INDIGO BIRD.** GROUP I. CLASS a.

This little Finch is an abundant summer resident in some portions of the state: while in other portions, apparently equally well suited to their tastes, only occasional pairs are seen. In Waupaca county, in July, 1876, it was one of the most abundant species, frequenting the borders of the fields in loose flocks. Its usual summer resorts are the borders of cultivated fields adjoining woods and groves. Willow and osier thickets, roadsides and pastures are also visited by them during the migrations.

Food: Of nineteen specimens examined, eighteen had eaten seeds of various weeds; one, two caterpillars; one, a grasshopper; one, two beetles; one, raspberries; and one, elder berries. Two had eaten insects, none of which were identified.

Caterpillars, worms, grasshoppers and seeds (De Kay). Small seeds of various kinds, as well as insects, some of which are taken on the wing (Audubon). Canker-worms and other caterpillars, spring-beetles, vine-chafers and curculios, hemiptera and seeds of weeds (Forbes).

109. *CARDINALIS VIRGINIANAS*, BP. **CARDINAL GROSBEAK.** GROUP II. CLASS a.

This gaudily attired songster, so highly prized both in this country and in Europe as a cage bird, is a southern species, and in this latitude it only occurs as a straggler at long and irregular intervals. Dr. Hoy reports that a few stragglers breed near Racine.

Food: Indian corn is its favorite article of food (Brewer). Fruits, berries, Indian corn and seeds (De Kay).

110. *PIPILO ERYTHROPHthalmus* (LINN.), VIEILL. **GROUND ROBIN; CHE-WINK.** GROUP I. CLASS b.

This retiring and peculiarly terrestrial species, though a common summer resident, is not as abundant as its two broods should tend to make it. Doubtless some fatal enemy holds it in check. Groves, thickets and woods crowded with underbrush, in upland situations, are its favorite haunts. From these resorts it only makes occasional visits into the adjoining fields or gardens, if near at hand. It is a large, strong bird, and capable of doing great mischief to the insects that infest its haunts.

Food: Of seventeen specimens examined, five had eaten small seeds; one, wheat; one, oats; one, raspberries; one, seven moths; three, nine beetles; one, ants; one, a wasp; one, an ichneumon; two, three grasshoppers; two, two cockroaches; one, a walking-stick (*Spectrum femoratum*), and four of its eggs; and one, a larve.

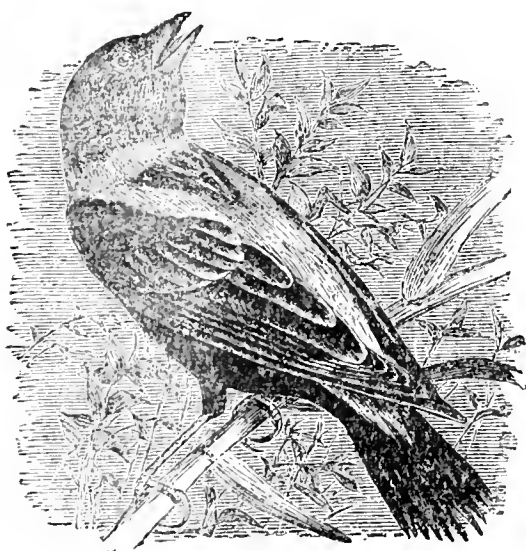
Worms, beetles, and eggs of insects (Wilson). Earth-worms, wire-worms, and the larvæ of insects (De Kay). Worms, insects and seeds (Samuels). Beetles and seeds of weeds (Forbes).

NOTE.—The following is found as a foot-note in Birds of Northeastern Illinois:

“Through Dr. Hoy I learn that two specimens of *P. arcticus* have been taken in Wisconsin, one near Milwaukee, where it is now preserved, and a second opposite Dubuque, Iowa. He has seen both specimens and is positive of their identity.”

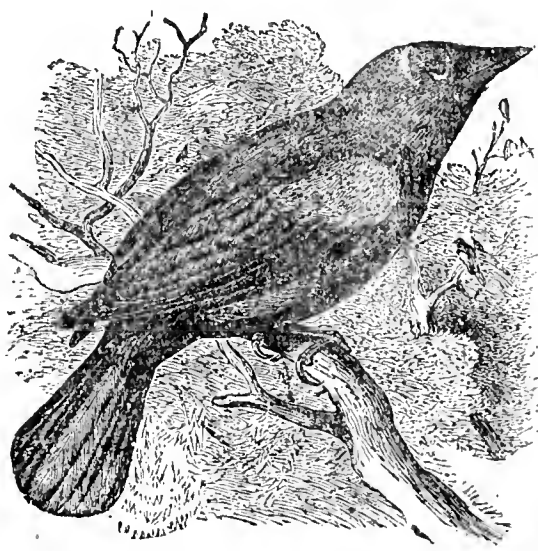
FAMILY **ICTERIDÆ**: AMERICAN STARLINGS.

FIG. 127.



BOBOLINK (*Dolichonyx oryzivorus*).
After B., B. and R.

FIG. 128.



RED-WINGED BLACKBIRD (*Agelaius phoeniceus*).
After B., B. and R.











Tabular Summary of Economic Relations showing the name and number of specimens eating animal and vegetable food, and the number of insects, cray-fish and earth-worms contained in the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirteen Bobolinks examined	10	Contained		Animal food.....	
	4			Vegetal food	
	2		2	Beneficial	
	6		11	Detrimental	
	6		27	Unknown.....	
Of six Cowbirds examined	4	Contained		Animal food.....	
	2			Vegetal food	
	3		9	Detrimental.....	
	4		12	Unknown.....	
Of eighty-four Red-winged Blackbirds examined	21	Contained		Animal food.....	
	80			Vegetal food	
	5		9	Detrimental.....	
	16		26	Unknown	
Of twenty-one Meadow Larks examined.....	21	Contained		Animal food.....	
	1			Vegetal food	
	7		10	Beneficial	
	15		30	Detrimental.....	
Of eight Baltimore Orioles examined.....	12	Contained	32	Unknown.....	
	8			Animal food.....	
	1			Vegetal food	
	6		50	Detrimental.....	
Of five Rusty Grackles examined	4	Contained	9	Unknown	
	3			Animal food.....	
	3			Vegetal food	
	1		8	Detrimental.....	
Of nine Purple Grackles examined..	3	Contained	9	Unknown.....	
	5			Animal food.....	
	6			Vegetal food	
	1		2	Detrimental	
	5		14	Unknown.....	

Table showing the kinds and number of insects, cray-fish and earth-worms eaten by the American Starlings.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirteen Bobolinks examined	1	Contained	1	Wasp.....	
	2		2	Lepidoptera.....	
	3		6	Diptera.....	
	3		7	Beetles	
	4		8	Orthoptera.....	
	1		1	Dragon-fly.....	
	1		1	Earth-worm	
	9		34	Adult forms.....	
	4		6	Larvæ.....	
Of six Cowbirds examined	1	Contained	10	Grasshopper eggs.	
	3		4	Lepidoptera	
	1		1	Hornet	
	3		9	Diptera.....	
	2		4	Orthoptera	
	2		4	Beetles	
	5		22	Adult forms	
Of eighty-four Red-winged Blackbirds examined	1	Contained	1	Larve	
	1		30	Moth eggs	
	2		2	Lepidoptera.....	
	5		7	Beetles	
	4		7	Grasshoppers	
Of twenty-one Meadow Larks examined	8	Contained	8	Mollusks	
	11		36	Adult forms	
	1		1	Larve	
	5		8	Lepidoptera	
	12		40	Beetles	
Of eight Baltimore Orioles examined	11	Contained	19	Grasshoppers.....	
	1		1	Dragon-fly.....	
	20		61	Adult forms	
	6		11	Larvæ	
	1		15	Insect eggs.	
Of eight Baltimore Orioles examined	6	Contained	50	Caterpillars.....	
	3		7	Beetles	
	2		2	Snails.....	
	4		9	Adult forms.....	
	6		50	Larvæ	

Table showing the kinds and number of insects, cray-fish and earth-worms eaten by the American Starlings — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of five Rusty Grackles examined	1	Contained	8	Moths	
	3		7	Beetles	
	1		2	Snails	
	3		17	Adult forms.....	
Of nine Purple Grackles examined .	1	Contained	2	Beetles	
	1		2	Water Scorpions .	
	1		1	Cray-fish	
	4		15	Adult forms.....	
	1		2	Larvæ.....	
	1		10	Insect eggs.....	

111. DOLICHONYX ORYZIVORUS (LINN.), SW. BOBOLINK; REED-BIRD; RICE-BIRD. GROUP I. CLASS b.

From the first till the middle of May these northward-moving night-travelers are spirited into our meadows out of the impending darkness, some to select summer homes, but many more to feed and rest and then hurry to the Saskatchewan country, as if anxious to cut short the time when they may return to the sunny south; and true to their instincts, early in August they come trooping back, and, joined by those who have bred by the way, they are all off by the middle of the month.

These birds confine themselves, until after the breeding season, almost exclusively to meadows, frequenting both the wet and the dry. Such haunts as these and their insectivorous habits place them among our most valuable birds. The occasional and brief visits which these birds make to grain-fields, in August, result in so trifling an injury that it should be entirely overlooked in view of the great service they render in the meadows.

It is greatly to the loss of the Northern States that so many of these birds are destroyed in the South, where their destruction to the rice crop is very great. But before we can consistently ask our Southern friends to stay this destruction, we must know more definitely than we do now what injury and what service the Bobolink renders to them, and what its economy is farther south where it spends the winter; we must know, too, what proportion of those which are permitted to come back may be induced to breed with us in preference to passing on to the north of the United States.

Dr. Brewer states that more recently it has been ascertained that these birds feed greedily upon the larvæ of the destructive cotton-worm, and that in so doing render an immense service to the cultivators of Sea Island cotton. What has been said in the Introduction in regard to the army-worm should be called to mind in this connection.

Food: Of thirteen specimens examined, one had eaten caterpillars; three others, larvæ, probably caterpillars; three, seven beetles, among them two lamellicorns and one elater; three, six dipterous insects, among them four Mucidæ; four, seven grasshoppers; one, a cricket; one, ten grasshoppers' eggs; one,

a moth; one, a dragon-fly; one, wheat; three, oats; and one, grass seeds. The stomachs of two specimens contained insects, none of which were identified.

Grubs, caterpillars, may-flies and other insects, green corn, wheat, barley and wild oats (Wilson). Crickets, grasshoppers, beetles, spiders and seeds of various kinds (De Kay). Crickets, grasshoppers, beetles, spiders and various grass-seeds (Samuels). Cotton-worm (Brewer). Canker-worm (Maynard). Hymenoptera, caterpillars, leaf-chafers, curculios and seeds of weeds (Forbes).

112. *MOLOTHRUS ATER* (BODD.), GRAY. COWBIRD. GROUP III. CLASS b.

This species reaches us early in the spring, and, like the Bobolink, disappears in August. I have never seen it later than the 9th of this month. "A strange point in the history of this species is its unexplained disappearance, generally in July, from many or most localities in which it breeds. Where it goes and for what purpose are unknown." In the spring they are often about stock-yards in quest of corn and seeds. Later they frequent pastures, keeping close to the cattle and horses, apparently for the purpose of obtaining the insects that are startled by the grazing herd. They are said also to feed upon the parasites that infest cattle.

Whatever speculations may be indulged as to the origin of the strange parasitism of the Cowbird, we must always regret that so pernicious a trait should have been engrafted upon bird-nature. Why the Cowbird should not incubate her own eggs does not appear in her structure; but that she generally deposits them where the foundlings will receive unstinted care is attested by the observations of many. Did not the adventitious fledglings result sooner or later in the destruction of the rightful young, we might deal more leniently with this species. As it is, on grounds of economy, and in view of the scant abundance of insectivorous birds in agricultural districts, the Cowbird merits no protection. Nearly every species which rears the young of this parasite is as useful as itself, but in most instances, if not all, a single Bunting supplants a brood of from three to five individuals. Where a pair of Vireos, for instance, might have reared four or five young birds of their kind, their energies have been devoted to a single Bunting.

The following are some of the birds that are known to act as foster parents to this species: *Turdus mustelinus*, *T. fuscescens*, *Minniotalta varia*, *Polioptila caerulea*, *Helminthophaga ruficapilla*, *Dendroica aestiva*, *D. virens*, *D. Blackburniae*, *D. discolor*, *D. Pennsylvanica*, *Geothlypis trichas*, *Siurus aurocapillus*, *Setophaga ruticilla*, *Passerina cyanea*, *Vireo olivaceus*, *V. solitarius*, *V. gilvus*, *V. noveboracensis*, *V. flavifrons*, *Sayornis fuscus*, *Empidonax minimus*, *Contopus virens*, *Sturnella magna*, *Harporhynchus rufus*, *Spizella domesticus* and *Pipilo erythrophthalmus*. It has been stated on a previous page that seven out of fourteen Pewees' (*S. fuscus*) nests visited at Ithaca, N. Y., in the spring of 1878, contained either the eggs or the young of the Cowbird. From this fact it appears that instead of twenty-eight or thirty-five Pewees which might have been reared in the seven nests, only seven Cowbirds could have taken their place as insect destroyers. Such is the check which this bird imposes upon the Pewee at Ithaca. If, as is generally believed, each existing Bunting represents a brood of young birds whose birth has been prevented, it is doubtless within the bounds of truth to assert that the number of Cowbirds existing at any time represents a deficiency in the bird population of the country of three times their number; and as the nests in which this parasite usually deposits her eggs are those of the most exclusively insectivorous species we have, it is evident that

the Cowbird must prevent the destruction of many more insects than it is possible for it to destroy. This is the more to be lamented since the Bunting has become so thoroughly accustomed to agricultural districts, where there are so many conditions which react against purely insectivorous birds, and where, more than anywhere else, the services of these birds are especially needed.

It should be added in this connection, that, so far as is known at present, the tendency of the Cowbird to prevent an undesirable abundance of birds is in a direction where there is the least danger. It appears wholly improbable that purely insectivorous birds can, under any circumstances, become over abundant, unless it be some forms which may be proved to feed largely upon beneficial insects. If there can be danger of any insect-eating bird, which is not destructive to other birds, becoming too numerous, it must be mainly among those which, like many of the Finches and Starlings, can subsist upon seeds, grains and fruits when insects are scarce. As the Cowbird does not appear to affect, in any marked degree, these birds, it is likely to prove to be less serviceable, in this direction, than either the Shrikes, Crows, Owls or Hawks. While it cannot be deemed safe, in the light of present knowledge, to extirpate this species, it should be subjected to very careful observation, with a view to ascertaining, if possible, its actual influence over the abundance of other birds, and then, if this method should prove to be inconclusive, it should be nearly exterminated from some wide and suitable north-and-south belt for a series of years, and the results carefully noted by competent observers. In this way it may be hoped that reliable results may be obtained upon which future action may be safely based.

Food: Of seven specimens examined, one had nothing in its stomach; one had eaten a hornet; two, three moths; one, a caterpillar; three, nine dipterous insects; one, three grasshoppers; one, a cricket; two, four beetles—one of them an elater; one, thirty eggs, probably those of a moth which had been eaten; two, seeds; and one, wheat.

One bird taken from the nest of a Pewee had in its stomach a hornet, a cricket, five flies, one caterpillar and two moths. Another taken from a Pewee's nest had been fed one elater, one moth, and two flies. It was this specimen which contained the thirty insect eggs.

Corn, rice and various species of intestinal worms (Wilson). Insects (Cooper). Intestinal worms (Audubon). Flies, grubs, beetles, etc. At times it visits corn-fields (T. M. Trippe, *Am. Nat.*, Vol. III, p. 294). Moths, caterpillars, beetles, hemiptera, spiders and seeds of weeds (Forbes).

113. *AGELÆUS PHŒNICEUS* (LINN.), VIEILL. **RED-WINGED BLACKBIRD.**
GROUP I. CLASS b.

In suitable localities no bird is as abundant as this species, and none as gregarious. All are familiar with Blackbird-concerts in the spring and with the clouds of Redwings which scud across the fields in the fall. Late in May or early in June these birds disband and repair to wet meadows or to the sloughs bordering streams, ponds and lakes, and these places, together with the high lands immediately adjoining them, are their feeding-grounds during June and July. Until after July—nearly four months—these birds feed almost exclusively upon insects and lead lives of nearly unalloyed usefulness. They breed, it should be remembered, in the native haunts of the army-worm, and it is presumable that they exert a great influence in holding them in check. Most of the corn-pulling which is attributable to the Blackbirds is done by the Purple Grackle, at least this has been my observation.

It is only late in August or early in September that these birds do any considerable damage, and then only in localities not far removed from their breeding grounds, for, as is well known, they return to the wet, reedy swamps to roost at night. After the corn has passed through the milk state and become hard and firm on the cob, the Redwings trouble it but little. They do not appear to be able to remove the kernels. They continue to visit the corn and stubble-fields, but it is for the purpose of obtaining the seeds of weeds and insects. Even while corn is in the milk state, the birds which visit the corn-fields appear to feed more upon the seeds of weeds than upon corn. All but five of the eighty-four specimens whose food is given below were taken between August 9th and September 20th, and the majority of these either while they were in the corn-fields or just as they were returning from them. By examining that list it will be seen that more than two-fifths of them had eaten no corn at all, while less than one-tenth had eaten only corn. Were the little injury which this species does evenly distributed over the country, instead of being localized about its breeding haunts and roosting places, I am convinced that it would never be felt.

Food: Of eighty-four specimens examined, thirty-seven had eaten corn and seeds of various weeds; thirty-one had eaten only seeds; seven had eaten only corn; three, rye; two, oats; eight, wheat; two, tender herbage; five, seven beetles; four, seven grasshoppers; one, a moth; and one, a caterpillar. In the stomachs of two birds there were bits of insects none of which were identified. Eight had eaten small mollusks; and one, berries.

The gleanings of old rice, buckwheat and corn fields in the fall and winter, and grub-worms, caterpillars, and other larvæ in the spring (Wilson). Canker-worms (Maynard). Caterpillars, beetles, spiders, wheat and seeds of weeds (Forbes).

114. ZANTHOCEPHALUS ICTEROCEPHALUS (BP.), Bd. YELLOW-HEADED BLACKBIRD. GROUP I. CLASS b.

This species is not very common except in certain localities. Its haunts are similar to those of the Red-winged Blackbird, with which it often associates in the fall. It breeds, as a rule, farther out in the marshes about lakes and ponds, and until fall confines itself quite closely to those localities. In its economic relations it differs from the last species only in degree — it being a larger and stronger bird and thus better able to do mischief in the fall, while its retiring habits render it less serviceable during the summer.

Food: Of three specimens examined, one had eaten only corn; one, corn and the seeds of black bind-weed; and one, only six beetles.

In Kansas, these birds render great service to farmers by destroying the swarms of young grasshoppers (I. M. McLaughlin, Am. Nat., II, p. 493).

115. STURNELLA MAGNA (LINN.), Sw. MEADOW LARK; FIELD LARK. GROUP I. CLASS b.

The sweet-voiced Meadow Lark is one of our most useful birds, and yet few are persecuted more than it. Every sportsman — and they are many — must learn to shoot on the wing, and invariably this bird is doomed to be their target. What is even worse, boys from the towns are permitted to stroll through the fields, shooting, in their recklessness, almost any bird they meet. Farmers must stop all of this if they would have birds do effective work in protecting their crops. The Meadow Lark is almost exclusively insectivorous and nearly one-half of its

food consists of grasshoppers. It is always in the open meadows and pastures where other birds are few, and its large size would enable it to render an immense service if it were permitted to become more abundant. Its flesh is sweet, but its natural enemies are too numerous, its nesting places too exposed, and its usefulness in destroying insects too great to justify its sacrifice to the taste of the epicure. In the south it is accused of pulling rye and wheat, but the only injury which I know of its doing in Wisconsin is its destruction of some of the ground and tiger-beetles.

Food: Of twenty-one specimens examined, twelve had eaten forty beetles — among them a may-beetle; one, a weevil; eight, ground-beetles; and one, a tiger-beetle; eleven, nineteen grasshoppers; four, seven caterpillars; and three, four other larvæ. Among the caterpillars a hairy form. Two, two small moths; one, a small dragon-fly; and one, a single thistle-seed.

Insects, grub-worms, caterpillars and grass seeds (Wilson). Seeds and various insects (De Kay). Beetles and various other insects, and grass seeds (Nuttall). Caterpillars, beetles — among them ground-beetles, one of the Silphidæ, flower-beetles and plant-beetles; grasshoppers, myriapods and corn (Forbes).

116. *STURNELLA MAGNA NEGLECTA* (AUD.), ALL. **WESTERN MEADOW LARK. GROUP II. CLASS a.**

This variety is reported by Dr. Hoy as occurring occasionally near Racine, and as it occurs commonly in Iowa it may be expected to occur occasionally in the western part of the state. Since writing the above I have found it on Hudson Prairie, St. Croix county, where it breeds.

117. *ICTERUS SPURIUS* (LINN.), BP. **ORCHARD ORIOLE; CHESTNUT HANG-NEST. GROUP I. CLASS a.**

Mr. Nelson gives this species as a rather common summer resident in North-eastern Illinois, and it has been so reported by Dr. Hoy from Racine. It is certainly a rare bird in Central Wisconsin. As its name implies, it is partial to orchards, is almost wholly insectivorous, and has not been known to molest any of the products of husbandry. Its southern habitat, however, excludes it from the state at large.

118. *ICTERUS GALBULA* (LINN.), COUES. **BALTIMORE ORIOLE; GOLDEN ROBIN; HANGNEST. GROUP I. CLASS b.**

This energetic and brilliantly attired vocalist and its ingenious hanging nest are familiar objects to all. Shady villages, orchards, and the vicinity of dwellings where trees abound are its favorite haunts, but groves and the borders of woodlands also offer it special attractions. In New England it is accused of feeding upon the esculent pods of pea-vines; and horticulturists complain that it feasts upon their berries, grapes and cherries — destroying at times more than it eats, by biting into the fruit. For these misdemeanors it has been consigned to extirpation; and yet, it would be equally consistent and generous to discharge a faithful servant for eating a few of the fruits he tends.

The Golden Oriole appears to be very fond of caterpillars of various kinds, and what is still more in its favor, it feeds extensively upon some forms which are either not relished by other birds or are protected in some way from them. Prof. J. H. Comstock informs me that he has seen it thrust its head through the web of the tent-caterpillar and remove the inmates. An instance which came

under my own observation shows how destructive they are to those leaf-rollers which tie themselves up so securely in the leaves of various trees and shrubs. While walking through a dense grove of young oaks, my attention was attracted by a loud noise of tearing leaves. On approaching the spot a family of Orioles flew to a large tree near by, and the noise ceased. In the stomach of one of these birds were found twenty of the leaf-rolling larvæ, which were very common at the time on the red oak. The strong beak of this bird fits it well for tearing open the firm cases which enclose these pests. It may be seen searching in the corners of the guards about shade-trees for chrysalids, and it often resorts to clover and grass-fields for insects.

Food: Of eight specimens examined, six had eaten three, twenty-five, fifteen, four, two, and one caterpillars respectively. Three had eaten seven beetles; and two, two snails. Twenty-five of the caterpillars were leaf-rollers, and seven of them the larvæ of a species of *Vanessa*.

Caterpillars, bugs and beetles, particularly one of a brilliant metallic green color (Wilson). Of three specimens examined by Prof. Forbes three had eaten caterpillars; one, beetles; and two, blackberries. Flies, beetles and caterpillars (De Kay). Smooth and hairy caterpillars, and other injurious insects, particularly the tent-caterpillar (Samuels). Caterpillars and green beetles (Audubon). Canker-worms (Maynard). Canker-worm, tent-caterpillar and green peas (Brewer). Tent-caterpillar (Prof. J. H. Comstock). According to Harris it is said to eat the pea-weevil and to knock open the pod to get the grub in the green pea. Tent-caterpillar (Le Baron).

119. *SCOLECOPHAGUS FERRUGINEUS* (COM.), SW. **RUSTY GRACKLE.** GROUP I.
CLASS a.

This species is mainly a migrant in Wisconsin. It occurs as late as May 16th at Berlin, and I have never obtained it in the fall earlier than the first of October; it is said, however, to pass through Illinois from September to the middle of November. It leaves too early in the spring and returns too late in the fall to do any injury to corn.

Food: Of five specimens examined, three had eaten seven beetles—among them three aquatic species; one, moths; one, two small mollusks; and two, small seeds.

Corn, principally, in October (Wilson). Grubs, beetles, moths and grains of various kinds (De Kay). Grasshoppers, caterpillars and other injurious insects, worms, crustaceans, various weed seeds, and grains left in the fields (Samuels).

120. *SCOLECOPHAGUS CYANOCEPHALUS* (WAGL.), CAB. **BLUE-HEADED BLACK-BIRD; BREWER'S GRACKLE.** GROUP I. CLASS a.

This species is met with very rarely in the eastern portion of the state, but as it occurs regularly in Minnesota it may be found along the Mississippi.

Food: A single mature male obtained in July on the large marsh just east of Princeton had its stomach greatly distended with grasshoppers.

121. *QUISCALUS PURPUREUS* (BARTR.), LICHT. **PURPLE GRACKLE.** GROUP II.
CLASS c.

I am not at all certain that the only Purple Grackle of Wisconsin is *æneus*, as appears to be the opinion of some recent writers. The birds which we have arrive early in April, are common during the summer, and by the middle of

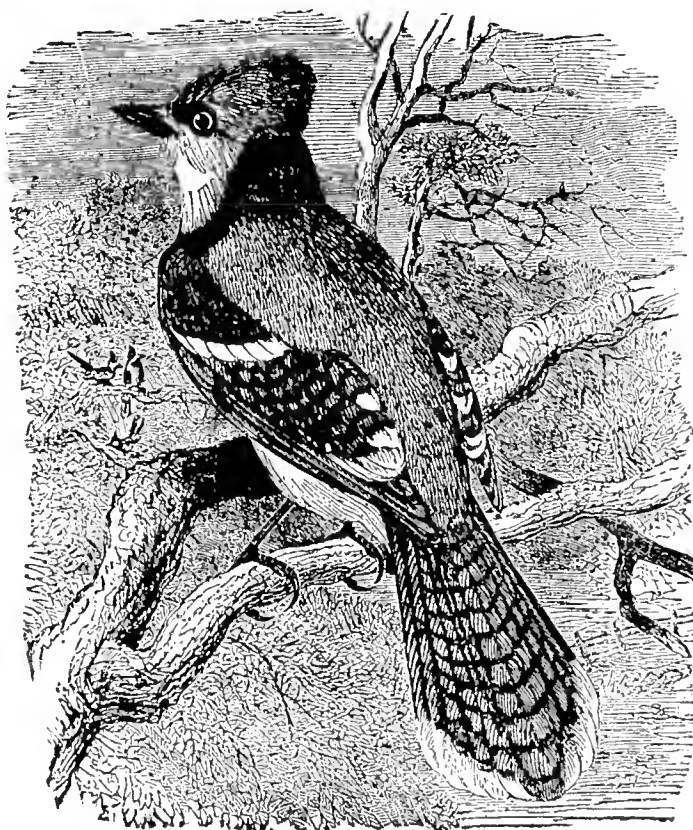
October all have gone south. They frequent the high lands as well as the low during the breeding season, and often nest in trees about dwellings and in villages. They are more familiar and less gregarious than the Red-winged Blackbird, and more destructive to corn in the fall, in proportion to their numbers. So far as I have observed, most of the corn-pulling in the spring is done by this species. It often follows the plow in quest of grubs and cut-worms, and in the fall small troops are often seen strolling about village lawns. In "Birds of the Northwest" occurs the following from Thomas T. Gentry, who, in speaking of this species, says: "It is obviously of great service in the destruction of insects. But it has one very bad trait, perhaps not generally known. Like the Crow, a not distant relative, it is fond of birds' eggs and tender nestlings, and it destroys a great many, particularly Robins." It is this trait which makes the economic position of the Purple Grackle doubtful.

Food: Of nine specimens examined, six had eaten corn; two, beetles; one, two water scorpions (*Nepidae*); one, a small cray-fish; and one, a few seeds. I have often seen these birds follow the plow and pick up and eat grub-worms and cut-worms.

Worms, grubs and caterpillars in the spring, and corn in the fall (Wilson). Grubs, beetles, caterpillars, moths and grain of various kinds (De Kay). Caterpillars, moths, beetles, beech nuts, acorns, and seeds of weeds and various wild plants (Samuels),

FAMILY CORVIDÆ: CROWS, JAYS, ETC.

FIG. 129.



BLUE JAY (*Cyanocitta cristata*). After Bd., Br. and Ridg.

Tabular Summary of Economic Relations showing the number of specimens containing animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of thirty-one Blue Jays examined.....	25	Contained	Animal food	<div></div>
	26		Vegetal food	<div></div>
	2		5 Beneficial	<div></div>
	7		10 Detrimental	<div></div>
	20		39 Unknown.....	<div></div>

Tabular summary of the number and kinds of insects and birds eaten or killed by the Blue Jay.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.	RATIOS REPRESENTED BY LINES.
Of thirty-one Blue Jays examined	1	Contained or killed	1 Ant.....	<div></div>
	2		2 Caterpillars	<div></div>
	15		30 Beetles	<div></div>
	3		4 Grasshoppers	<div></div>
	1		3 Young Robins....	<div></div>
	21		47 Adult forms.....	<div></div>
	5		7 Young forms.....	<div></div>

122. CORVUS CORAX, LINN. RAVEN. GROUP III. CLASS b.

This species rarely visits the southern portion of the state, and only in the winter. During October and November, 1877, it was very common throughout the whole length of the Flambeau river. Several were observed daily, and it always occurred singly or in pairs. Notwithstanding the carrion-eating propensity of this species, its insectivorous habits, and the fact that it does not now frequent the settled portions of the state, its reputed robbery of birds' nests must class it among the birds whose injuries exceed their services. Its large size, its fondness for flesh, and its ability to move where it will, all indicate that but few birds which breed in its haunts may not suffer from its attacks.

Food: Dead fish, and animal matter of all kinds, birds' eggs, young ducks, chickens, lambs, reptiles, grubs, worms and mollusks (Wilson). Dead animals, birds' eggs, young chickens, lambs and fawns, when they are found unprotected, lizards, snakes, and occasionally potatoes and grain (Cooper). Field mice, grubs, worms and grains (De Kay). Small animals of every kind, dead fish, carrion, insects, worms, eggs, nuts, berries, and other kinds of fruits (Audubon).

123. CORVUS FRUGIVORUS, BARTR. COMMON CROW. GROUP III. CLASS b.

The Crow is common throughout the southern portion of the state, and, to a considerable extent, resident during the winter. It is not, however, numerous, and I have not seen it north of Stevens Point, in the eastern part of the state.

In the western part it occurs as far north as New Richmond. As in the Eastern States, it frequents agricultural districts, and is most abundant in the wooded sections. It is much upon the ground in open fields, but there is no piece of woodland through which it does not stroll.

The wary, suspicious nature, so characteristic of the Crow in the Eastern States, appears to be wholly acquired, and is not possessed by the Crow of the Western Plains, nor of that of unsettled districts where it is not molested. However desirable an unsuspicious and familiar nature may be in a bird like the Robin, when possessed by one likely to become rapidly abundant, when left to itself, and whose propensities are those of the Crow, it detracts from rather than adds to its usefulness. With all deference to the opinions of ornithologists, who should speak with authority on this subject, I must believe that they err when they advise the withdrawal of restraint from this species. Every element of its nature fits it for an almost unlimited abundance when fostered by the conditions of agriculture; no bird can take its food from it, and there is nothing edible which it may not eat. Its familiarity with man in regions where its rights have never been questioned, and the readiness with which young birds accept domestication, leave no doubt that it would take unbearable liberties about dwellings. Nesting, as it does, in high, inaccessible tree-tops, it has no natural enemies, in thickly settled districts, which could hold it within safe bounds. Its ability to overpower any of our small birds, its ravenous appetite for flesh, especially when young, and its fondness for the eggs and young of birds, would, under conditions of no restraint, make it more destructive to bird-life than all the Hawks and Owls combined. There are only a few large injurious insects, like the may-beetles, which it can destroy better than other birds, while its large, clumsy body utterly disqualifies it for the vast work which is done by the birds whose life it would not permit. Viewed in this light, the Crow can but be regarded as one which must be held in the scantiest abundance.

Food: Of two specimens examined, each had eaten corn, and one a small chrysalid. In the stomach of one were found two very small pieces of bones.

Myriads of mice, moles, beetles, grubs, caterpillars and worms, young birds and their eggs. It robs hens' nests and kills young chickens. In the spring it pulls young corn; sometimes whole corn-fields are laid waste by the feeding of a single flock lighting upon it at once (Wilson). Fish, immense numbers of grubs and grasshoppers, clams and oysters (Cooper). Follows the plowman for worms and larvæ of insects; pulls corn; eats corn in the milk state, and kills young chickens, turkeys and goslings, and destroys every egg in its reach (De Kay). Fruits, seeds, vegetables, snakes, frogs, lizards, and other small reptiles; worms, grubs, insects, and eggs of birds (Aud.). Insects and various vermin, young Robins and birds' eggs (Samuels).

124. *PICA RUSTICA HUDSONICA* (LAB.), RIDG. **AMERICAN MAGPIE.**
GROUP III. CLASS b.

This bird is said to visit Michigan, Wisconsin (Hoy) and Northern Illinois in the winter. These visits are only occasional, however, and by but a few birds.

Food: Seeds, carrion, insects, etc., and the eggs and young of other birds, of which it destroys a great many (T. M. Trippe). Destroys plantations of young oaks by pulling up the acorns. Destroys great numbers of small birds and birds' eggs. Alights on the backs of cattle to rid them of the larvæ that fester in the skin. Eats carrion, worms, insects of every description, and grains (Wilson). Largely carrion, eggs, young birds and fruits (Cooper). Worms, grubs, young birds, birds' eggs and carrion (De Kay).

125. CYANOCITTA CRISTATA (LINN.), STRICKL. BLUE JAY. GROUP III.
CLASS b.

The Blue Jay is distributed throughout the state, but, like the Robin, is far more abundant in settled than in unsettled portions. It is a summer and winter resident, but less abundant in the latter than in the former season. Groves, fields, villages, and the vicinity of dwellings are more frequented than woodlands; and although it is an arborial species, it is much upon the ground in quest of food. Occasionally it extracts insects from the crevices of the bark on the trunks of trees. When unmolested it becomes more and more familiar, and keeps closer to dwellings; and during the winter, particularly, they crowd into villages to feed upon the crumbs from the kitchens. It is so like the Common Crow in very many of its traits, that much which has been said of that bird applies equally well to this. Its smaller size, however, renders it less dangerous to other birds as a class, and better fitted to do service in destroying insects. Did not the destruction of the eggs and young of other birds appear to be a general trait rather than an individual peculiarity of the Blue Jay, it would be necessary to throw but little restraint over it. As it is, it must be held within narrow limits. The Jay is not an especially valuable bird to agricultural interests when compared with other species. From the first of August until the first of April, two-thirds of the year, not more than one-tenth of its food consists of insects, and during the rest of the year, less than two-thirds of it consists of this material. During August, September and October, about one-tenth of its food consists of grain and other useful products, and it is not especially destructive to the seeds of weeds; while during May and June it is known to feed to a considerable extent upon the eggs and young of other birds.

Dr. Brewer, however, in speaking of this species in "Birds of North America," says: "The Jay is charged with a propensity for destroying the eggs and young of the smaller birds, and has even been accused of killing full-grown birds. I am not able to verify these charges, but they seem too generally conceded to be disputed. These are the only serious grounds of complaint that can be brought against it, and are more than outweighed ten-fold by the immense service it renders to man in the destruction of his enemies. Its depredations on the garden or farm are too trivial to be mentioned." He also says: "Dr. Kirtland has also informed me of the almost invaluable services rendered to farmers in his neighborhood, by Blue Jays, in the destruction of caterpillars. When he first settled on his farm, he found every apple and wild cherry-tree in the vicinity disfigured and denuded of its leaves by the larvæ of the *Clisiocampa Americana*, or tent-caterpillar. The evil was so extensive that even the best farmers despaired of counteracting it. Not long after the Jays colonized upon his place he found they were feeding their young quite extensively with these larvæ, and so thoroughly that two or three years afterwards not a worm was to be seen in the neighborhood; and more recently he has searched for it in vain, in order to rear cabinet specimens of the moth."

I insert this quotation because it illustrates so well the great danger of over-estimating the real service which any particular bird may render at a given time. In the first place, it is by no means certain, from what Dr. Kirtland says, that the disappearance of the tent-caterpillar from his neighborhood, at the time he mentions, was in any marked degree due to its destruction by the Blue Jay. It is a well known fact that the tent-caterpillar, and very many other noxious insects, may be very abundant in a given locality for a few years and then suddenly disappear almost entirely, when birds could have had no very

great influence in the extermination. In all of these sudden disappearances parasitic foes and climatic influences appear to be the prime agents of destruction. If these pests were as abundant in Dr. Kirtland's neighborhood as his statement indicates, it must have been a large colony of Jays indeed that could have counteracted them, alone, in so short a time. It is the bird's mission to aid in preventing these gigantic culminations of insect life, or to lengthen the periods between their occurrence, and not so much to beat back a wave that has broken over them in spite of all their efforts to prevent it. In the second place, the destruction of the tent-caterpillar in orchards, by birds, is not of so great moment as some have thought. There is perhaps no insect troublesome to orchards more directly and easily controlled than this species. Its tent makes it perfectly conspicuous before it has done any mischief; and since the whole colony congregate under the web when they are not feeding, every caterpillar can be easily and quickly destroyed. Small insectivorous birds should rarely be supplanted by large omnivorous species; and the bird that destroys the Warbling Vireo or the Robin should render an exceedingly valuable service to warrant its encouragement in orchards and gardens; for this reason I regard a Blue Jay as much out of place in an orchard, during the breeding season, as a Canada thistle in a grain-field.

Food: Of thirty-one specimens examined, nineteen had eaten acorns; fifteen, thirty beetles, among them several species of *Harpa'lidæ* and a *Cetonia*; two, two caterpillars; two, two grubs; one, some other larvæ; two, grasshoppers; five, corn; one, wheat; and one, berries. No stomach was found to contain only insects; and of those which contained beetles, their remains never composed more than one-fifth of the entire contents, and usually less than one-tenth. One bird was observed to kill three out of a brood of four young Robins and to eat one of them.

Young birds, carrion and acorns (Wilson). Chestnuts, acorns, cherries, large insects, carrion, and the eggs and young of birds (De Kay). The larvæ of *Dryocampa senitoria* (A. J. Cook). In the winter, berries of barberry or black-thorn, with a few eggs or cocoons of insects. In the spring, buds of shrubs, caterpillars and other insects; late in the spring and through the greater part of summer, the eggs and young of smaller birds; later in the summer and early autumn, berries, small fruits, grains, and a few insects; later in the autumn, chestnuts and beech-nuts (Samuels). Beech-nuts, chestnuts, acorns, corn, pears and apples (Audubon). Grubs of the may-beetle (Harris). Tent-caterpillar (Dr. Kirtland). Eggs, young birds, insects, caterpillars, acorns, chestnuts, corn and small fruits (J. M. Wheaton). Caterpillars, corn (Forbes).

126. *PERISOREUS CANADENSIS* (LINN.), BP. CANADA JAY; MOOSE BIRD.
GROUP III. CLASS b.

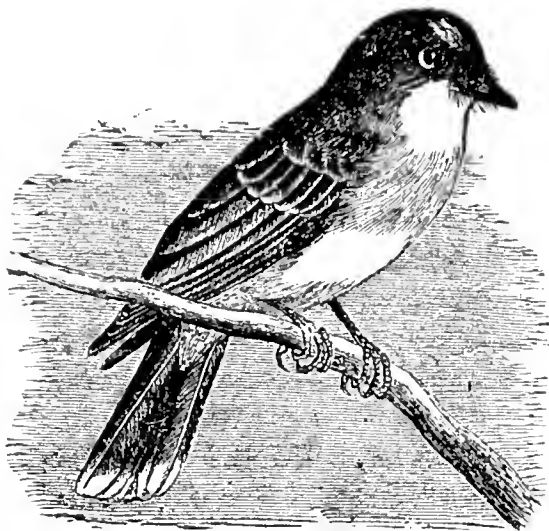
The Canada Jay is a common winter resident in the pineries, where it makes itself familiar about every logging-camp. A few may breed in those regions, but I could not learn that it was ever seen there during the summer.

Food: In the stomachs of two specimens, taken in October, were grasshoppers, cockroaches, larvæ and small seeds.

Seeds, insects and berries (Cooper). Berries, caterpillars, eggs of birds and carrion (De Kay). Eggs of ants, insects, leaves of fir trees. Robs Crows' nests (Audubon). I knew of a single pair of these birds destroying the young in four nests of the Common Snowbird (*J. hyemalis*) in a single day (Samuels).

FAMILY TYRANNIDÆ: AMERICAN FLYCATCHERS.

FIG. 130.



KINGBIRD (*Tyrannus Carolinensis*). After B., B. and R.

Tabular Summary of Economic Relations showing the name and number of specimens eating animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.		CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twelve Kingbirds examined	12	Contained	Animal food.....	<div></div>
	3		Vegetal food	<div></div>
	5		5 Beneficial	<div></div>
	4		14 Detrimental.....	<div></div>
	6		28 Unknown.....	<div></div>
Of thirty-seven Pewees examined	37	Contained	Animal food.....	<div></div>
	1		Vegetal food.....	<div></div>
	12		25 Beneficial	<div></div>
	17		70 Detrimental	<div></div>
	20		89 Unknown.....	<div></div>
Of forty-one Wood Peewees examined	41	Contained	Animal food.....	<div></div>
			Vegetal food	<div></div>
	8		11 Beneficial	<div></div>
	14		25 Detrimental.. ...	<div></div>
	40		233 Unknown.....	<div></div>
Of five Traill's Flycatchers examined..	5	Contained	Animal food	<div></div>
	1		Vegetal food	<div></div>
	2		4 Beneficial	<div></div>
	1		7 Detrimental.....	<div></div>
	4		15 Unknown	<div></div>

Tabular Summary of Economic Relations of Flycatchers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty three Least Flycatchers examined	23	Contained		Animal food.....	
				Vegetal food	
	5		8	Beneficial	
	5		10	Detrimental	
	22		131	Unknown.....	

Table showing the kinds and number of insects and spiders eaten by the Flycatchers.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twelve Kingbirds examined	1	Contained	1	Bee.....	
	2		2	Lepidoptera.....	
	2		7	Diptera.....	
	4		17	Beetles	
	4		4	Dragon-flies	
	1		3	Mollusks.....	
	11		47	Adult forms.....	
	1		30	Moth eggs.....	
Of thirty-seven Pewees examined	9	Contained	27	Hymenoptera ...	
	12		35	Lepidoptera	
	7		27	Diptera.....	
	14		49	Beetles	
	4		4	Hemiptera	
	12		17	Orthoptera	
	4		5	Neuroptera	
	1		1	Spider	
	37		165	Adult forms ¹	
	8		19	Larvæ.....	
Of five Traill's Flycatchers examined..	1	Contained	1	Ichneumon.....	
	1		1	Fly	
	2		8	Beetles	
	2		3	Dragon-flies	
	4		26	Adult forms.....	

¹ Scale only one-fourth.

Table showing the kinds and number of insects and spiders eaten by the Flycatchers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of forty-one Wood Pe-wees examined.....	11	Contained	29	Hymenoptera	
	6		7	Lepidoptera	
	14		41	Diptera.....	
	18		66	Beetles	
	2		2	Hemiptera.....	
	1		1	Grasshopper	
	9		13	Dragon-flies	
	41		268	Adult forms ¹	
	1		1	Larve.....	
	1		40	Tipulid eggs.....	
Of twenty-threeLeast Flycatchers exam-ined	4	Contained	39	Hymenoptera ...	
	4		4	Lepidoptera.....	
	4		18	Diptera.....	
	10		30	Beetles	
	1		3	Heteroptera	
	2		4	Dragon-flies.....	
	1		1	Spider.....	
	23		148	Adult forms ²	
	2		3	Larvæ.....	

127. TYRANNUS CAROLINENSIS (LINN.), BD. KINGBIRD; BEE MARTIN.
GROUP I. CLASS b.

The Kingbird arrives early in May, and many of them appear to withdraw before the close of August. It is very common and frequents fields, pastures, meadows and the vicinity of dwellings. Nearly all of its food is taken upon the wing, but it occasionally comes to the ground in the manner of the Bluebird for insects. In "Birds of Northeastern Illinois," it is stated that Mr. Rice saw one of these birds plunge repeatedly into a stream in the manner of a Kingfisher. An examination of the stomach of this specimen showed that it had been eating aquatic insects. I have taken from the stomachs of young birds of this species bits of shells of small mollusks (*Sphærium*); how they are obtained is unknown to me.

It often nests in orchards, sometimes close to the house, and the solitary trees standing in fields and pastures are very desirable breeding places for it; from these places it has a good chance to watch for passing insects. It would tend to make these and other birds more abundant if more trees were left standing in the cultivated fields, or were planted there.

Dr. Brewer is of the opinion that writers have somewhat exaggerated the

¹ Scale only one-half.

² Scale only one-fourth.

quarrelsome disposition of this species. According to his observations, Hawks, Owls, Crows, Grackles, Jays and Cuckoos are about the only birds which it regularly attacks. For these it is always on the alert, and with good reason, no doubt. He also states that a pair of these birds once had their nest in an apple tree in which the Baltimore Oriole and the Robin had their nests at the same time, and that the three families appeared to entertain the most amicable relations. My own observations are in harmony with these statements. A pair of Warbling Vireos once had their nest in an oak tree in a pasture which also bore a nest of the Kingbird. The two nests were only four feet apart, and both contained half grown young when the discovery was made.

The only apparently serious objection to this species with which I am acquainted is its destruction of dragon-flies, and of these insects it appears to be very fond. How serious this objection may be, future investigation must decide.

Food: Of twelve specimens examined, four had eaten seventeen beetles; four, four dragon-flies; one, a bee; one, six crane-flies; one, a large moth; one, a butterfly (*Pieris protodice*); and three, a few raspberries.

Bees, the large black gad-fly and other insects (Wilson). Insects, among them bees, and some berries (Cooper). Mostly winged insects, occasionally grasshoppers and bees (Samuels). Dragon-flies are a favorite food; it also eats bees and may-beetles (J. L. Hersey, Am. Nat., III, 437). Of seven stomachs examined, two contained hymenoptera; one, a wasp; five, lepidoptera; two, caterpillars; four, beetles; one, ground-beetles; three, orthoptera; one, crickets; one, locusts; two, grasshoppers; one, a spider; one, a harvest-man; one, wheat; and one, fruit (Forbes). Of the food of two specimens shot in an apple orchard, canker-worms, which infested it, made forty-three per cent., vine-chafers (*Anomala binotata*) seventeen per cent., spring-beetles (*Melanotus*) ten per cent., scavengers twenty per cent., Lampyridæ three per cent., and various hymenoptera seven per cent. (Forbes).

128. MYIARCHUS CRINITUS (LINN.), CAB. GREAT CRESTED FLYCATCHER.
GROUP I. CLASS b.

This species is certainly rare in Central Wisconsin, but is given as a rather common summer resident in Northeastern Illinois, and Dr. Hoy gives it as breeding at Racine. It is said to inhabit damp swampy woods, and to be quarrelsome toward birds smaller than itself.

Food: Bees, and other winged insects until fall, when it eats berries (Wilson). Insects, grapes and berries (De Kay). Winged insects, berries, caterpillars, crickets and grasshoppers (Samuels). Insects as long as they can be obtained, then grapes and several species of berries.

129. SAYIORNIS SAYI (BP.), BD. SAY'S FLYCATCHER. GROUP II.
CLASS a.

Probably accidental in Wisconsin. Dr. Brewer states that one specimen was obtained by Dr. Hoy near Racine, and sent to Mr. Cassin for identification.

130. SAYIORNIS FUSCA (GM.), BD. PEWEE; PHOEBE-BIRD. GROUP I.
CLASS b.

This familiar and confiding species arrives early in April and remains until the beginning of October. During this long stay it leads a busy, useful life, though not one wholly unalloyed with mischief. It is an expert fly-catcher, but, like

the Bluebird, marks much of its prey upon the ground, and falls directly upon it. By this habit it is fitted for a wider usefulness and a greater abundance. Its places of nesting — under old sheds, beneath porches and bridges, under the eaves of houses, under slightly projecting ledges, and under overhanging, rocky cliffs — are familiar to many.

How it is imposed upon by the Cowbird has already been told.

Food: Of thirty-seven specimens examined, nine had eaten twenty-seven hymenoptera; four, seven ants; one, a wasp; four, fifteen ichneumon-flies; four, four chrysididæ; twelve, thirty-five lepidoptera; seven, eighteen caterpillars; seven, sixteen moths; one, a butterfly (*Colias philodice*); fourteen, forty-nine beetles; one, a ground beetle; one, a tiger-beetle; one, a lady-bird (*Coccinella 9-notata*); two, nine leaf-chafers; one, a leaf-beetle (*Chrysomela* ?); one, two squash-beetles (*Diabrotica vittata*); one, two *Diabrotica duodecim-punctata*; one, a curculio; seven, twenty-seven diptera; three, three crane-flies; four, twenty Mucidæ; twelve, seventeen orthoptera, crickets and grasshoppers; one, a spider; three, two hundred and fifty-eight insect eggs; three, four small dragon-flies; one, a caddis-fly; one, a leaf-hopper (*Enchenopa*); one, a heteropterous insect (one of the *Corisiæ*); and one, dogwood berries. From the stomach of one Pewee were taken ten ichneumon-flies — among them a *Lampronota varia* and four other species — one large moth, having a body 1.25 of an inch long, four smaller moths, and one caddis-fly. An ichneumon-fly, which another specimen had eaten, belonged to the genus *Comptus* (?). In the stomachs of six young birds were found fifteen flies (*Mucidæ*), two hymenopterous insects, two grasshoppers, three crickets, one caterpillar and three moths.

Smilax berries and “bees” (Wilson). Insects in the spring and summer; in the winter, berries of various kinds (Samuels). Of five specimens examined, two had eaten hymenoptera; one, lepidoptera; four, beetles; two, diptera; and one, hemiptera (Forbes).

131. CONTOPUS BOREALIS (SW.), BD. OLIVE-SIDED FLYCATCHER.

GROUP II. CLASS a.

Reported to have been quite common at one time near Racine, but later to be quite rare (Hoy). Not an uncommon migrant in Northeastern Illinois. It is a woodland species, and Nuttall found it quarrelsome. I think I observed this species at River Falls, June 2, 1882.

Food: Wasps, bees, and similar insects (Brewer). One specimen examined had eaten wasps (Forbes).

132. CONTOPUS VIRENS (LINN.), CAB. WOOD PEWEE. GROUP I. CLASS b.

No Flycatcher is so abundant in Central Wisconsin as this species; even in the deep woods of Clark and Chippewa counties its prolonged whistle proclaims its abundance there. With us it is as yet a retiring species, keeping closely within the woods and groves, or, at most, venturing upon their borders. At Ithaca, N. Y., however, it is becoming much more familiar. There it breeds in orchards, about dwellings and in the city. According to Nuttall, it displays at times a tyrannical disposition. So far as I have observed, it is perfectly peaceable and allows other birds to pass it unmolested. Nearly all of its food is taken upon the wing, and when in the woods it usually selects some small opening between the tree-tops for its hunting-grounds.

Food: Of forty-one specimens examined, eighteen had eaten sixty-six small beetles, among them seven metallic-green beetles and several lamellicorns; four-

teen, forty-one dipterous insects, among them twelve large crane-flies; two, a butterfly each, one of which was an *Argynnis*; nine, thirteen small dragon-flies; eleven, twenty-nine hymenopterous insects, among them twelve ants, an ichneumon-fly (?) and one of the *Augochlora* (?); one, a heteropterous insect (*Corisica*); one, a moth; one, a grasshopper; and one, a larve of a saw-fly (?).

I have seen one Wood Pewee capture and feed to its young, which had recently left the nest, forty-one insects in the course of forty-five minutes. Several of these insects were moths.

Winged insects (Wilson). Insects caught on the wing (De Kay). Of three specimens examined, one had eaten hymenoptera; one, caterpillars; two, beetles; one diptera; and one, dragon-flies (Forbes).

133. EMPIDONAX ACADICUS (GM.), BD. **ACADIAN FLYCATCHER.** GROUP II.
CLASS a.

It appears doubtful whether this species has ever been taken in Wisconsin. The fact that Wilson, Audubon and Nuttall appear to have mistaken other birds for this, may perhaps be a sufficient explanation of its reported occurrence.

134. EMPIDONAX TRAILLI (AUD.), BD. **TRAILL'S FLYCATCHER.** GROUP II.
CLASS b.

A summer resident, but uncommon. It occurs in woodlands and retired groves. At Waupaca one was obtained in a small tamarack swamp early in July, where, from its great excitement on my approach, I suspect that it had a nest in the vicinity at the time.

Food: One bird examined had in its stomach two small dragon-flies, one ichneumon-fly and two small beetles. Two others had eaten small beetles and dipterous insects, and one, small berries.

135. EMPIDONAX MINIMUS, BD. **LEAST FLYCATCHER.** GROUP I. CLASS b.

This species is the most abundant and the most familiar of our Empidonaces. It arrives about the middle of May and departs late in September. The borders of woods, groves, and hedges along fences are its usual haunts. In the East it has become much more familiar than with us. There it frequents orchards and gardens, and has been known to nest in a clump of honeysuckles on the corner of a piazza. It appears to live amicably with other birds, and to have strong attachments for nesting-places once chosen. On the whole, it appears to be a more desirable bird to have in orchards and about dwellings than either the Kingbird or the Purple Martin. Twice I have found the young fledglings of this species being fed by their parents late in July, and once early in August, from which we may infer that it rears two broods each season with us.

Food: Of twenty-three specimens examined, ten had eaten thirty beetles — among them two squash-beetles (*Diabrotica vittata*), a lady-bird and two weevils; four, eighteen dipterous insects; one, two small heteropterous insects, equal in size to chinch-bugs; four, thirty-nine hymenopterous insects — two small ichneumon-flies and thirty-seven winged ants; two, three caterpillars; one, a moth; two, four small dragon-flies; and one, a small spider.

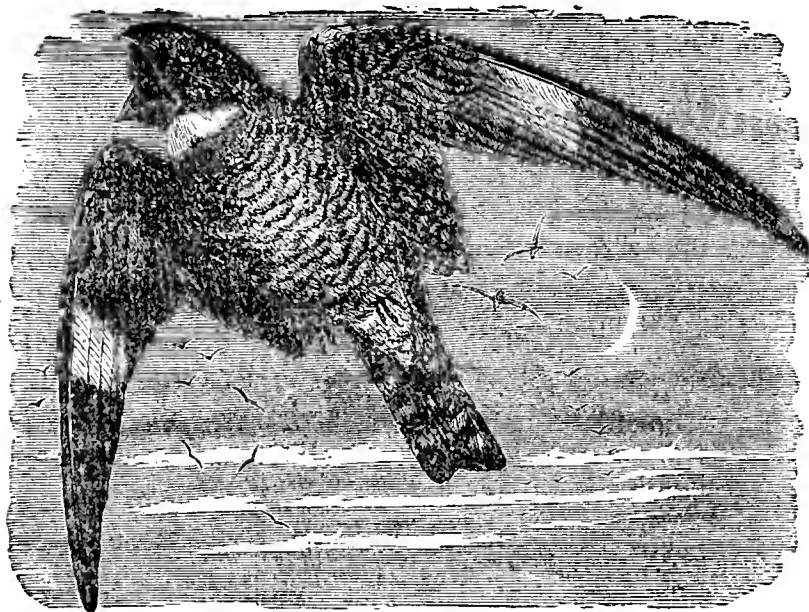
Canker-worm (Maynard). Of ten specimens examined by Forbes, two had eaten hymenoptera; two, lepidoptera; eight, beetles — ground-beetles, gyrinidæ, curculios and hydrophilidæ; one, hemiptera; one, locusts; one, spiders; and two, blackberries.

136. EMPIDONAX FLAVIVENTRIS, Bd. **YELLOW-BELLIED FLYCATCHER.**
GROUP II. CLASS a.

A single specimen of this species was obtained at Worcester, July 26, 1876. Dr. Hoy identified it at Racine, during the summer of 1869. Mr. Nelson speaks of it as a common migrant in Northeastern Illinois. None of the fragments of five insects found in its stomach were identified.

FAMILY CAPRIMULGIDÆ: GOATSUCKERS.

FIG. 131.



NIGHT-HAWK (*Chordeiles popetue*). After Bd., Br. and Ridg.

Tabular Summary of Economic Relations showing the number of specimens eating animal and vegetable food, and the number of insects taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
Of two Whippoorwills examined	2	Contained		Animal food.....	<div></div>	
				Vegetal food		
				Beneficial		
	2		10	Detrimental	<div></div>	
	2		14	Unknown.....	<div></div>	
Of five Night-hawks examined	5	Contained		Animal food.....	<div></div>	
				Vegetal food		
	1		1	Beneficial	<div></div>	
	2		8	Detrimental	<div></div>	
	5		83	Unknown.....	<div></div>	

Table showing the number and kinds of insects eaten by the Goatsuckers.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of two Whippoorwills examined.....	2	Contained	10	Moths.....	
	2		14	Beetles	
	2		24*	Adult forms.....	
	1		162	Insect eggs ¹	
Of five Night-hawks examined.....	1	Contained	3	Moths.....	
	3		19	Beetles	
	2		23	Heteroptera.....	
	1		5	Grasshoppers.....	
	2		4	Neuroptera.....	
	5		94	Adult forms.....	

137. ANTROSTOMUS VOCIFERUS (WILS.), BP. WHIPPOORWILL; NIGHT-JAR. GROUP I. CLASS a.

This very useful nocturnal bird is a common summer resident, but its breeding habits and its fondness for secluded retreats during the day appear to preclude it from maintaining abundant numbers in thickly settled districts.

Food: Its food, as indicated by two specimens, appears to consist largely of moths, some of which have an extent of wing of two inches. It also eats many beetles, among which are click-beetles and small lamellicorns.

Large moths, ants, grasshoppers, and such insects as frequent old logs (Wilson). Exclusively winged insects (De Kay). Almost entirely nocturnal lepidoptera (Samuels). Ants, large moths and beetles (Audubon).

138. CHORDEILES POPETUE (V.), BD. NIGHT-HAWK; BULL-BAT. GROUP I. CLASS b.

The Night-hawk, by many supposed to be the Whippoorwill, seems gradually growing less numerous. Where, twenty years ago, it was common to see thousands of these birds towards sunset, pursuing insects low over clover-fields in swift and tangled curves, now it is rare to see more than twenty thus engaged. At Ithaca, N. Y., both it and the Whippoorwill are uncommon birds. Dr. Brewer, however, states that it is becoming more numerous about the larger Eastern cities, and that in Boston it has taken to breeding on the flat Mansard roofs of buildings. It is exceedingly destructive to insects, and is especially active during cloudy weather and in the morning and evening twilights. It is very desirable that it should maintain an ample abundance. This is the more desirable since it frequents, so much, cultivated fields. The sportsmen of some of our cities are in the habit of going outside of the city limits toward sunset, and practicing shooting these birds on the wing, preparatory to duck-shooting in the fall. The services of these birds are too valuable to justify such a practice.

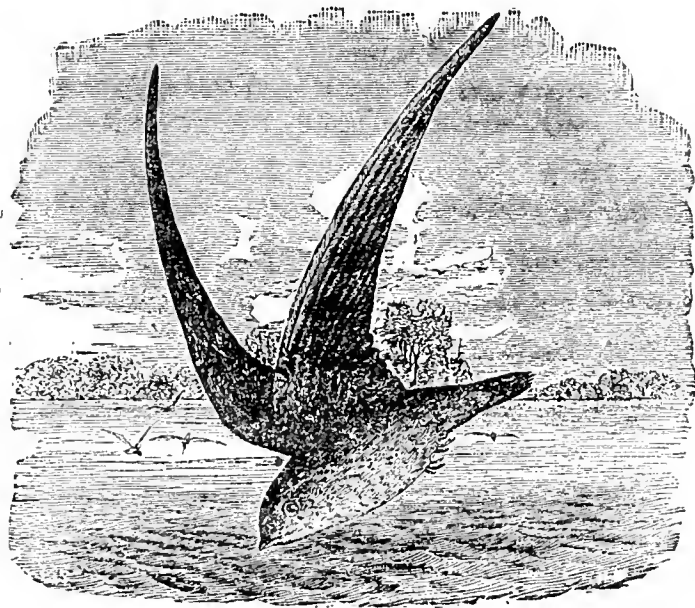
¹ Scale only one-third.

Food: In the stomachs of four specimens were found may-flies, a large dragon-fly, beetles, water-boatmen, scorpion-bugs, berry-bug-like heteroptera and grasshoppers. The material taken from the stomach of one specimen weighed nine grammes. From the stomach of another were taken five small grasshoppers, eight larvæ of hemipterous insects (*Corisice*), and ten scorpion-bugs, none of them less than three-fourths of an inch long.

Wasps, flies, beetles and other insects. Nearly a snuff-box full were taken from the stomach of one (Wilson). Winged insects (De Kay). Beetles, moths, caterpillars, crickets and grasshoppers (Audubon).

FAMILY CYPSELIDÆ: SWIFTS.

FIG. 132.



CHIMNEY SWIFT (*Chaetura pelagica*). After Baird, Brewer and Ridgway.

139. CHÆTURA PELASGICA (LINN.), STEPH. CHIMNEY SWIFT. GROUP II. CLASS a.

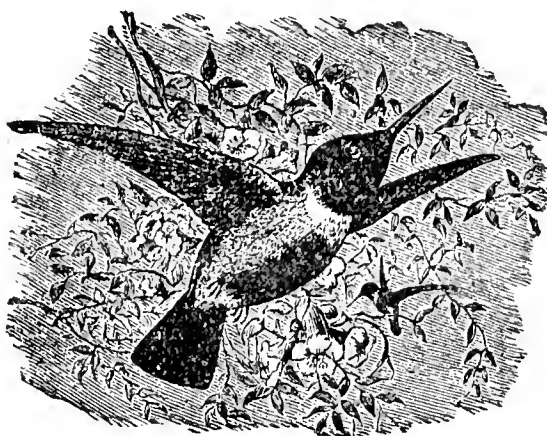
The Chimney Swift, in July, 1876, was much more abundant in the northern unsettled portion of the state than I ever saw it in the southern. There it doubtless follows its primitive habit of breeding in hollow trees. We have no bird so incessantly on the wing or so dexterous and swift in its aerial movements. While it is abroad at all times of the day, it is out earlier in the morning and later in the evening than the Night-hawk; and it is said to feed its young at intervals during the whole night. Such traits as these appear to make this a very valuable bird; and when we know more definitely than we do now in regard to its food, it may be found advisable to erect cheap hollow towers for it to breed in, in order that it may become more abundant away from cities.

Food: Of three specimens examined, two had nothing in their stomachs, and the other stomach contained two flies.

Of three specimens examined by Prof. Forbes, three had eaten hymenoptera; two, ants; one, lepidoptera, adults; one, beetles; one, ground-beetles; one, rove-beetles; one, plant-beetles; two, dipterous insects; two, hemiptera; and one, spiders.

FAMILY **TROCHILIDÆ**: HUMMING-BIRDS.

FIG. 133.



BLACK-CHINNED HUMMING-BIRD (Not found in Wisconsin). After B., B. and R.

140. **TROCHILUS COLUBRIS**, LINN. **RUBY-THROATED HUMMING-BIRD.**
GROUP I. CLASS b.

This exquisite little species is very common with us, and, according to my observations, quite as much a bird of the woodlands as of open, sunny places, where flowers abound.

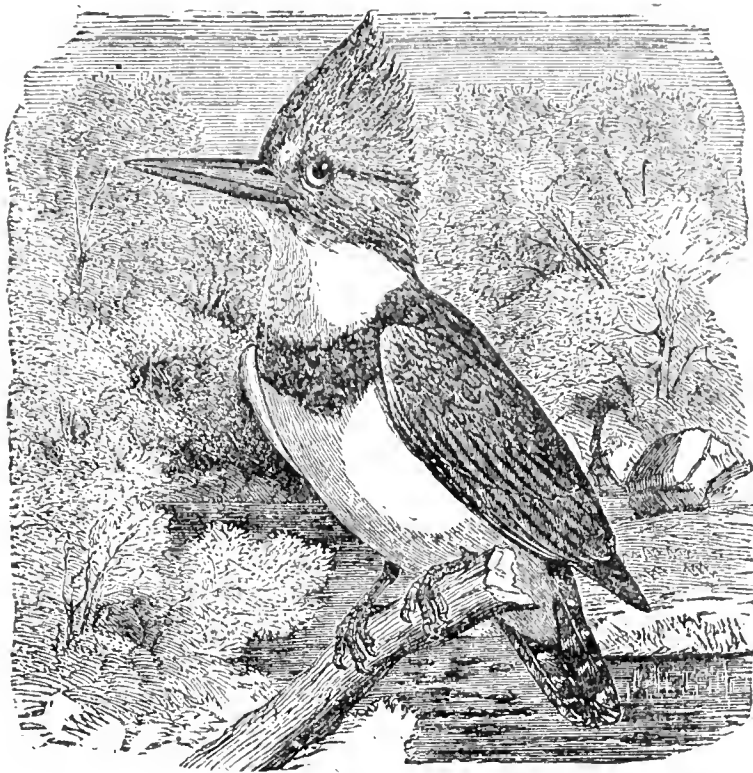
I have met with it commonly in the heart of the heaviest timber of Jefferson county, and among the deep woods in the northern portion of the state. In these places it moves high among the outer branches of the trees, searching for insects upon the leaves, as it does for honey and insects within the corollas of flowers. The wooded banks of streams, willow and alder thickets, hazel patches and the depths of tamarack swamps are also visited by it. They appear to be pugnacious and quarrelsome among themselves, and the little Black-capped Chickadee retreats before these emerald pigmies without the slightest resistance, as if it had long ago acknowledged their superiority.

Food: From the stomachs of five specimens were taken three small spiders, one aphid, and one small chalcidian (?), together with twelve other insects.

Honey of flowers, small beetles and winged insects (Wilson). Principally insects (Samuels). Sweet juice of flowers (De Kay). Small beetles, spiders and winged insects, most of which are captured in the corolla of flowers (J. M. Wheaton).

FAMILY **ALCEDINIDÆ**: KINGFISHERS.

FIG. 134.



BELTED KINGFISHER (*Ceryle alcyon*). After Bd., Br. and Ridg.

141. CERYLE ALCYON (LINN.), BOIS. BELTED KINGFISHER. GROUP II.
CLASS b.

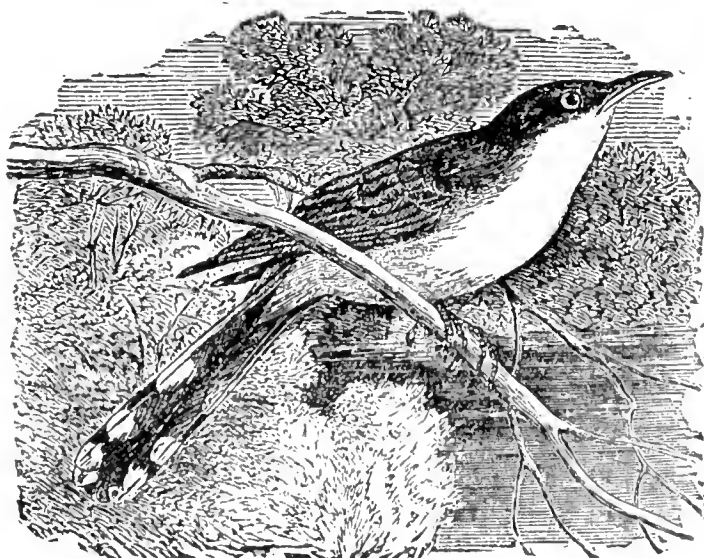
A common summer resident, frequenting all our streams as long as they are free from ice.

Food: Six specimens examined had eaten only fish.

Fish (Wilson, Cooper). Mainly small fish (De Kay). Fish; occasionally a frog or meadow-mouse (Samuels).

FAMILY **CUCULIDÆ**: CUCKOOS.

FIG. 135.



YELLOW-BILLED CUCKOO (*Coccyus Americanus*). After Bd., Br. and Ridg.

Tabular Summary of Economic Relations showing the number of specimens eating animal and vegetable food, and the number of insects and spiders taken from the stomachs, classified as to economic relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirteen Black-billed Cuckoos examined..	13	Contained		Animal food.....	
				Vegetal food	
	3		3	Beneficial	
	11		93	Detrimental	
	4		31	Unknown.....	
One Yellow-billed Cuckoo examined...	1	Contained		Animal food.....	
				Vegetal food	
				Beneficial	
	1		9	Detrimental	
				Unknown.....	

Table showing the number and kinds of insects and spiders eaten by the Cuckoos.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirteen Black-billed Cuckoos examined..	2	Contained	13	Hymenoptera	
	9		63	Caterpillars	
	2		10	Beetles	
	6		26	Orthoptera	
	2		2	Harvest-men	
	10		53	Adult forms	
	10		70	Larvæ.....	
One Yellow-billed Cuckoo examined...	1	Contained	9	Caterpillars	
				Adult forms	
	1		9	Larvæ.....	

142. COCCYGUS ERYTHROPHTHALMUS (WILS.), BD. **BLACK-BILLED CUCKOO.**
GROUP II. CLASS b.

The Cuckoo is a common summer resident, arriving early in May and withdrawing again toward the last of September. Its usual haunts are the interior of woods, groves and the wooded banks of streams. Frequently it visits the grassy swales in marshes where small clumps of willows abound, and during the spring it may be seen in orchards and villages. I know of no insectivorous bird so excessively voracious as it, unless it be the next species. The amount of material which may be found in its stomach at one time seems out of all pro-

portion to its size and activity. I have taken thirty caterpillars (*Dryocampa senatoria*), three-fourths of an inch long, from the stomach of one of these birds, and six large grasshoppers from that of another. That which gives this species a special value as an insect-destroyer is its fondness for those hairy, spiny and otherwise protected caterpillars not so generally preyed upon by other birds; and it is this trait, together with the fact that it appears to refuse all vegetable food, that goes far toward compensating for what injury it may do in plundering the nests of other birds. It is, therefore, much worthier of encouragement and protection than either the Blue Jay or the Crow.

Food: Of thirteen specimens examined, nine had eaten caterpillars — among them were eight of the fall web-worms (*Hyphantria textor*), thirty-three of the oak-caterpillars (*Dryocampa senatoria*), one of the Io caterpillars (*Saturnia Io*), six of the antiopa caterpillars (*Vanessa antiopa*), and one of the caterpillars of the archippus butterfly (*Danaïs archippus*). One contained five larvæ of the large saw-fly (*Cymbex Americana*); six, twenty-five grasshoppers; one, a cricket; two, ten beetles; and two, two harvest-men. These observations, it will be seen, differ quite markedly from those given below.

Small mollusks, etc. (Wilson). Minute mollusks and animals, fruits, berries, etc. (De Kay). Insects and their larvæ, small fruits, and the eggs and young of small birds (Samuels). Principally fresh-water mollusks, fish and aquatic larvæ (Audubon). Tent-caterpillar (A. J. Cock, *Am. Nat.*, VIII, 368). Eggs of the Solitary Vireo (Brewer). One specimen had eaten beetles (Forbes).

143. COCCYBUS AMERICANUS (LINN.), BP. YELLOW-BILLED CUCKOO.

GROUP II. CLASS b.

This species is a summer resident, but not common. I have seen but one specimen. Its habits are similar to those of the last species, and, economically, probably it ranks with it. In speaking of its relations to other birds, Dr. Coues says: "Although not parasites, like the European species, devoid of parental instinct, they have their bad traits, being even worse enemies of various small, gentle birds; for they are abandoned thieves, as wicked as Jays in this respect, continually robbing birds of their eggs, and even, it is said, devouring the helpless nestlings.

Food: The specimen which I examined had its stomach crammed almost to overflowing with a large, black, slightly hairy caterpillar, with a faint dorsal stripe of white, which is often so abundant on black walnut trees as to completely defoliate them.

Caterpillars, particularly those which infest apple trees, and the eggs of other birds (Wilson). Insects, and, at times, small birds and their eggs (Cooper). Hairy caterpillars, large beetles, berries, grapes, and occasionally the eggs of small birds (De Kay). Caterpillars, and other larvæ destructive to fruit and shade trees (Samuels). Caterpillars, butterflies, beetles, wood mollusks, mulberries, grapes, and the eggs of small birds (Audubon). Various large winged insects, various grubs, wood-inhabiting mollusks, different kinds of berries and other soft fruits, and the eggs of small birds (Coues). Of four specimens examined, three had eaten caterpillars; one, beetles; two, harvest-men and vegetable substance (Forbes).

FAMILY PICIDÆ: WOODPECKERS.

FIG. 133.



YELLOW-BELLIED WOODPECKER (*Sphyrapicus varius*). After B., B. and B.

Tabular Summary of Economic Relations showing the number of specimens eating animal and vegetable food, and the number of insects, spiders and snails taken from the stomachs, classified as to Economic Relations under the heads Beneficial, Detrimental and Unknown Relations.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.	
One Pileated Woodpecker examined...	1	Contained		Animal food.....		
	1			Vegetal food		
	9			Beneficial		
	1		18	Detrimental.....		
				Unknown.....		
Of twenty-one Hairy Woodpeckers examined	21	Contained		Animal food.....		
	3			Vegetal food		
	16		82	Beneficial		
	12		121	Detrimental		
				Unknown.....		
Of seventeen Downy Woodpeckers examined	16	Contained		Animal food		
	6			Vegetal food		
	1		1	Beneficial		
	7		133	Detrimental.		
	13		48	Unknown.....		

Tabular Summary of Economic Relations of Woodpeckers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of thirty Yellow-bellied Woodpeckers examined.....	27	Contained		Animal food	
	9			Vegetal food	
	1		1	Beneficial	
	4		4	Detrimental	
	26		265	Unknown.....	
Of eighteen Red-headed Woodpeckers examined.....	16	Contained		Animal food	
	11			Vegetal food.....	
	2		2	Beneficial	
	6		8	Detrimental	
	15		66	Unknown.....	
Of twenty-two Golden-winged Woodpeckers examined	20	Contained		Animal food	
	7			Vegetal food	
	2		18	Beneficial	
	8		127	Detrimental	
	19		1333	Unknown.....	

Table showing the kinds and number of insects, spiders and snails eaten by the Woodpeckers.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
One Pileated Woodpecker examined....	1	Contained	18	Ants.....	
	1		18	Adult forms.....	
				Larvæ.....	
Of seventeen Downy Woodpeckers examined	2	Contained	7	Ants.....	
	2		3	Caterpillars	
	1		1	Fly	
	9		25	Coleoptera	
	1		110	Hemiptera	
	1		1	Spider	
	10		141	Adult forms	
	14		40	Larvæ.....	
	1		1	Pupa	

Table showing the kinds and number of insects, spiders and snails eaten by the Woodpeckers — continued.

NUMBER AND NAME OF SPECIMENS EXAMINED.			CLASSIFICATION OF FOOD.		RATIOS REPRESENTED BY LINES.
Of twenty-one Hairy Woodpeckers examined	10	Contained	105	Ants.....	
	4		15	Lepidoptera.....	
	14		61	Coleoptera	
	1		1	Snail.....	
	12		121	Adult forms.....	
	16		82	Larvæ.....	
	2		9	Ootheca (Blatta) .	
Of four Black-backed Three-toed Woodpeckers examined..	4	Contained	33	Wood-borers	
				Adult forms	
	4		38	Larvæ.....	
Of thirty Yellow-bellied Woodpeckers examined	26	Contained	242	Ants.....	
	1		1	Caterpillar	
	1		1	Tipulid	
	5		22	Beetles	
	2		2	Grasshoppers	
	1		1	Spider.....	
	27		269	Adult forms	
	1		1	Larve	
Of eighteen Red-headed Woodpeckers examined	5	Contained	18	Ants.....	
	1		1	Caterpillar	
	12		42	Beetles	
	1		1	Heteroptera.....	
	3		4	Orthoptera.....	
	15		95	Adult forms.....	
	1		1	Larve	
Of twenty-two Golden-winged Woodpeckers examined	17	Contained	1059	Ants ¹	
	4		4	Caterpillars	
	4		27	Beetles	
	2		110	Chinch-bugs.....	
	19		1240	Adult forms ¹	
	5		273	Ant pupæ ¹	
	2		11	Moth pupæ.....	
	4		4	Larvæ.....	

¹ Scale only one-half.

144. *HYLOTOMUS PILEATUS* (LINN.), Bd. **PILEATED WOODPECKER.****GROUP I. CLASS b.**

This gigantic Woodpecker is a common resident in the pineries, where it frequents especially the windfall tracts abounding in old dead trees. In the character of its food it appears to be most closely allied to the Yellow-bellied Woodpecker, seldom drilling into hard wood for wood-borers. Some of its chiselings, however, into soft decaying timber for ants, and doubtless grubs, are often on a gigantic scale, furrows six inches wide and deep and twelve feet in length being commonly made by it in standing stubs.

Food: A specimen taken on the Flambeau river had its stomach distended with large black ants, small beetles, and some vegetable material.

Insects and larvæ which it takes from decaying pines and other trees. Said also to eat corn, but this is doubtful (Wilson). Insects which it takes from beneath the bark of trees; also corn, chestnuts, acorns, and fruits (De Kay). Borers, black ants, beech-nuts and Indian corn (Samuels).

145. *PICUS VILLOSUS*, LINN. **HAIRY WOODPECKER.** **GROUP I. CLASS b.**

This species is a common resident, breeding, as yet, mostly in woodlands and forests. Early in the spring and after the breeding season, it pays frequent visits to orchards, nurseries and villages, where, in the southern portion of the state, it performs a work in which but one other bird, the Downy Woodpecker, takes part, at least to any notable extent. This work is that of destroying wood-boring larvæ, and these pests furnish it nearly one-half of its food both winter and summer. Another trait which gives special importance to its services is that of hammering on the loose and shaggy bark of trees for the purpose of startling the moths and other insects that have hidden beneath it; when they take wing, it pursues to their next place of lighting and captures them. I have seen this bird repeatedly capture moths in this way. Practically, therefore, it, and doubtless all of the Woodpeckers, to some extent, perform in part the work of a nocturnal fly-catcher.

It has been known to nest in orchards and in fence posts, but it seems destined to become less and less numerous as its natural breeding places are destroyed. It enjoys, however, so wide a range in the variety of its food, that, could its breeding habits be changed, it would probably be able to maintain an ample abundance when properly protected.

Food: Of twenty-one specimens examined, eleven had eaten fifty-two wood-boring larvæ; five, thirteen geometrid caterpillars; ten, one hundred and five ants; six, ten beetles; two, two cockroaches; two, nine oötheca of cockroaches; two, two moths; one, a small snail; one, green corn; one, a wild cherry; and one, red elder berries. In the stomach of one of these was a little woody fiber, but this was probably swallowed unintentionally. One of the above birds had in its stomach eleven wood-boring larvæ (*Lamides*?) and twelve geometers; another, thirteen larvæ of long-horn beetles and four cockroach oötheca; another, nine wood-boring larvæ; and two others together had three wood-boring larvæ, and nine larvæ not coleopterous.

The apple-borer and other larvæ, insects and their eggs (Wilson). Insects and their larvæ, which infest trees (De Kay). Eggs and larvæ of injurious insects which burrow in the wood of orchard and forest trees; it also eats small fruits and berries, and some assert that it eats the buds and blossoms of trees (Samuels). One specimen had in its stomach hymenoptera (Forbes). Cecropia cocoons punctured by them (*Am. Nat.*, Vol. XV, p. 241, F. M. Webster).

146. *PICUS PUBESCENS*, LINN. **DOWNY WOODPECKER.** GROUP I. CLASS b.

This species, like the last, is a common resident, but not as abundant as that bird, and its habits resemble those of its large cousin as closely as does its dress; it is, however, a more frequent visitor to orchards. The statements in regard to its probing the bark of young smooth trees to suck the sap appear to be unfounded.

Food: Of seventeen specimens examined, seven had eaten twenty wood-boring grubs; nine, twenty other larvæ, among them three caterpillars; two, seven ants; three, four beetles; one, a chrysalid; one, a fly; one, one hundred and ten small heteropterous insects, about the size of chinch-bugs; one, a spider; one, acorns; and one, small seeds. In the stomachs of four was found a little vegetable fiber, but this was probably taken incidentally, as in each case the bird had eaten wood-boring larvæ. From the stomach of each of two of these birds were taken eight large wood-boring grubs.

Of all our Woodpeckers, none relieve our orchards of so many vermin (Wilson). Insects and their larvæ, grapes and poke-berries (De Kay). In summer, insects and their larvæ; in autumn, fruits of various kinds, among them grapes and poke-berries (Audubon). They are very industrious, and particularly fond of boring the bark of apple trees for insects (Brewer). Wood, hymenoptera, lepidoptera, hemiptera and spiders. Three specimens (Forbes).

147. *PICOIDES ARCTICUS* (SW.), GRAY. **BLACK-BACKED THREE-TOED WOODPECKER.** GROUP I. CLASS a.

This Woodpecker is common in the northern portion of the state during the fall and winter, and probably resident to some extent during the summer, and I have taken it at Worcester in July. It rarely moves south in the winter beyond the heavy timber line. In the pineries its services must be very great, as it appears to feed almost exclusively upon wood-boring larvæ.

Food: Four specimens examined had eaten respectively, thirteen, twelve, seven, and six larvæ of long-horn beetles. Nothing else was found in the stomachs of these birds.

Wood-boring insects (De Kay). Besides insects they eat berries and small fruits (Audubon).

148. *PICOIDES AMERICANUS*, BREHM. **BANDED THREE-TOED WOODPECKER.** GROUP II. CLASS a.

This species is introduced in the present connection on the authority of Dr. Brewer, who says, in *Birds of North America*: "They occur also in Southern Wisconsin, in winter, where Mr. Kunlien has several times in successive winters obtained single individuals."

149. *SPHYROPICUS VARIUS* (LINN.), BD. **YELLOW-BELLIED WOODPECKER.** GROUP II. CLASS a.

This species is an abundant summer resident in most suitable localities, but during the breeding season it is confined quite exclusively to forests and the deeper woodlands. At other times, between the last of March and the first of October, it frequents, besides its breeding haunts, more open woods, groves, orchards and villages. Like the preceding species, it is seldom seen upon the ground; but, unlike them, it rarely feeds upon wood-boring larvæ. My own

notes appear to indicate, however, that it is quite as insectivorous as they are. "The peculiar formation of its tongue," upon which some lay so much stress in deciding its ability to destroy insects, it should be observed, only disqualifies it for obtaining wood-boring larvæ, and not for other insects.

That the Yellow-bellied Woodpecker does sometimes suck the sap of trees is rendered probable by an instance which came under my observation April 22, 1878. On this date one of these birds was observed at work on a small pignut hickory standing on the campus of Cornell University. Two horizontal series of holes had been recently pierced through the bark, one above the other, but on nearly opposite sides of the tree, and separated by a distance of about four feet. The Woodpecker was seen to pass along each of these series of holes from one end to the other, deliberately, but not forcibly, thrusting its bill into each successive perforation, as if removing something from it. When it had visited every hole it flew to another tree of the same kind standing near by; there it was seen to perform the same operation upon a similar single series of holes. After loitering about the second tree for two or three minutes it returned to the first and repeated the action already described, when, after a short interval, it repeated its visit to the holes on the second tree. On returning from dinner, about twenty minutes afterwards, I found the Woodpecker still at work, and the sap was running down the trunk of the tree from one of the series of holes, wetting it to a distance of a foot below the perforations. On examining these holes they were found to extend through the bark and into the wood to a depth of about an eighth of an inch, and to have a diameter but little greater than that of the bird's bill near its base; toward the bottom they narrowed greatly along their vertical axes and widened considerably along their horizontal axes, so as, at the bottom, to be narrowly oblong—so narrow, indeed, as, in most cases, to be mere incisions through the inner bark. I have examined a large number of the holes made by this species in the bark of the apple and maple, and wherever there has been a series of holes the series has always been horizontal, and the holes have conformed to the description of those above, except that often the wood was merely indented by a close series of punctures. These holes have always been in sound wood, and I have detected no evidence that any insect had been at work beneath the bark at the points where the perforations were made; and the holes have all been so narrow where they have passed through the inner bark, that it does not appear probable that the inner bark could have been the object for which these punctures were made.

This species is, however, very generally accused of feeding extensively upon the inner bark of trees. In regard to this point Dr. Brewer says: "In the spring of the year these birds prey largely upon the inner bark of trees, and where they exist in great numbers they often do a great deal of mischief. In April, 1868, I visited gardens in Racine, in company with Dr. Hoy, where these Woodpeckers had every successive spring committed their ravages, and was eye-witness to their performance. Their punctures were unlike those of the *pubescens*, being much deeper, penetrating the inner bark, and, being repeated in close proximity, the bark becomes entirely stripped off after a while, often resulting in the girdling and complete destruction of the tree. In one garden of some considerable size, all the mountain ash and white pine trees had thus been killed. In prairie countries, where trees are deficient and their cultivation both important and attended with difficulty, these birds prove a great pest, and in a few hours may destroy the labor of many years." Dr. Coues, in his "Key to North American Birds," in speaking of the genus to which this species belongs, says: "Birds of this genus feed much upon fruits, as well as insects, and also, it would

seem, upon soft inner bark (cambium); they injure fruit trees by stripping off the bark, sometimes in large areas, instead of simply boring holes."

I have taken the inner bark of trees, or some material which closely resembled it, from the stomachs of six out of thirty specimens which I have examined; three of these specimens were taken in orchards in April, one in August and two in September. The last three were obtained in heavy timber. It should be remarked, however, that in neither of these cases was there more than a trifle of this material; so small, indeed, were the amounts, that they can hardly be regarded as proving much, especially if it is true that these birds are sap-suckers, for it might readily have been taken unintentionally. In cases where the bark is stripped off by these birds in large areas, there would seem but little doubt as to the object of the birds; but in the case of the punctures which these birds usually make, it does not appear that they offer the best way of getting at the inner bark, and the process necessitates the removal of a very large amount of bark in order to furnish even a meager meal for so large a bird. The horizontal series of holes, too, would furnish the readiest means of obtaining sap, while these do not appear to facilitate especially the gathering of the inner bark. No instance in which the bark of trees has been stripped off by these birds has come under my observation, nor do I know of an instance where their puncturings of the bark have been fatal or appreciably injurious to the tree. Their case must stand open at present for a closer investigation.

Food: Of thirty specimens examined, twenty-six had eaten two hundred and forty-two ants; five, twenty-two beetles; one, a crane-fly; two, two grasshoppers; one, a caterpillar; one, wild grapes; one, dogwood berries; one, small seeds; and six had in their stomachs a few bits of fibrous material. Of those birds which had eaten ants, fifteen had nothing else in their stomachs.

Principally insects, among them beetles (Wilson). Insects, worms and berries (De Kay). Wood-worms, beetles, grapes and various berries (Audubon). Several alcoholic specimens sent to the Smithsonian Institution by Dr. Hoy, from Racine, were examined by Prof. S. F. Baird, who found in their stomachs, beetles, larvæ and boring beetles, ants, and fragments of the inner bark of the apple tree (Dr. Bryant, Boston Soc. Nat. Hist., X, 91). Of four specimens, two had eaten beetles; one, hemiptera; and three, wood (Forbes). Sucks sap from the white beach (Am. Nat., Vol. XV, p. 810, H. C. Bumps).

150. *CENTURUS CAROLINUS* (LINN.), BP. **RED-BELLIED WOODPECKER.**
GROUP I. CLASS b.

This rather southern species is uncommon in Wisconsin. I have taken but a single specimen, in September, 1876. Wilson states that many of the young which leave the nest before they are able to fly, and climb to the top of the trees, are killed by Hawks.

Food: The single specimen examined had in its stomach small fragments of beetles and pieces of acorns, corn, insects and Indian pepper (Wilson).

151. *MELANERPES ERYTHROCEPHALUS* (LINN.), SW. **RED-HEADED WOOD-PECKER.** GROUP II. CLASS c.

This species is an abundant summer resident in openings, and in thickly settled heavy timbered districts. It is a frequent visitor to orchards and cultivated fields, but is only occasionally seen on the ground. Often it sits upon a fence post and watches for passing insects, which it takes upon the wing in the manner of the Bluebird. So far as I have observed, it is not destructive to wood-

boring larvæ, and although it feeds extensively upon insects, other materials furnish it with much of its food. There are some records against it which awaken grave apprehensions as to its usefulness. Audubon accuses it of sucking the eggs of Bluebirds, Martins and Pigeons; and in the American Naturalist (Vol. XI, p. 308) Mr. Charles Aldrich has a note accusing the Red-headed Woodpecker of killing very young Cayuga Ducks. It kills the ducklings by a single blow upon the head and then eats the brains. As this Woodpecker performs no work in the destruction of insects peculiar to itself, and as it is somewhat destructive of grains and fruits, its depredations upon small birds must be very limited indeed to warrant any encouragement being extended to it.

Food: Of eighteen specimens examined, twelve had eaten beetles, among them two long-horns, one click-beetle, one common beetle (*Silpha peltata*), and one ground-beetle; one, a grasshopper; two, three crickets; one, a caterpillar (*Edema albifrons*); three, apples; two, wild black cherries; and one, corn.

Cherries, pears, apples, berries of sour gum, corn in the milk, wood-borers, bugs, caterpillars and other insects (Wilson). Apples, pears, cherries, Indian corn in the milk, and insects which infest decaying trees (De Kay). It is more fond of berries than most of its relatives (Samuels). Cherries, apples, pears, peaches, figs, mulberries, and corn; it sucks the eggs of Bluebirds, Martins and Pigeons (Audubon). Sap of the sugar maple (C. A. White, Am. Nat., VII, 496). Young Cayuga Ducks (Charles Aldrich, Am. Nat., XI, 308). Corn from the barnyard, and grasshoppers (Am. Nat., Vol. XIII, p. 522, C. Aldrich). Beetles (Cetoniidæ), seeds of weeds and other vegetable matter (Forbes).

152. COLAPTES AURATUS (LINN.), SW. **GOLDEN-WINGED WOODPECKER.**
GROUP II. CLASS a.

This species is the most abundant and the most terrestrial of our Woodpeckers, and it is a more frequent visitor to prairies than any of its allies. Open fields, pastures and meadows are its favorite resorts, and it is only during the migrations that it is at all common in heavy timber away from cultivated fields. Like the Robin, it obtains its food both upon and beneath the surface of the ground. It is especially fond of ants, and often tears open their hills to obtain them; and it searches much among the fallen leaves and mould in groves for chrysalids and insects in other stages. Like the last species, it does not appear to be destructive to wood-boring larvæ. Ants appear to form the greater part of its food, but it will be seen that it is quite destructive to some of the ground-beetles, usually regarded as beneficial.

The habits of ants, as to their economic relations, have been so little investigated that it is difficult to state whether a bird which feeds largely upon them renders a service or an injury. The injury which ants sometimes do to ripe pulpy fruits, their protection to aphidæ by warding off their enemies, and their obstructions in the way of ant-hills which they often build in damp meadows, are bad traits, but lead to no very marked evil consequences. Some of the leaf-cutting ants are undoubtedly injurious. On the other hand, the fact that ants are often seen dragging about larvæ and various forms of insects which they sometimes carry into their homes, suggests that they may be quite destructive to insects, or scavengers at least. The occurrence of bits of egg-shell in the stomach of one of these birds suggests that it may be guilty of sucking the eggs of other birds.

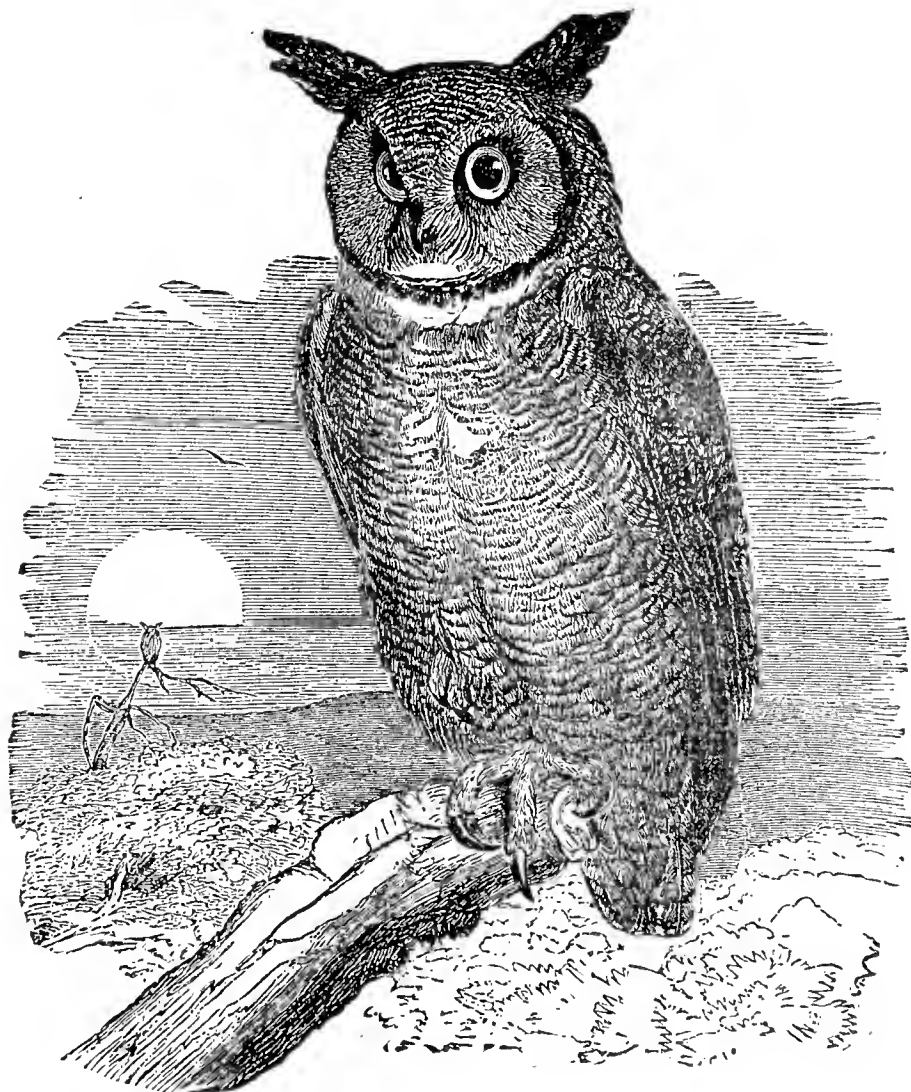
Food: Of twenty-two specimens examined, seventeen had eaten 1,059 ants; five, 273 ant pupæ; four, 27 beetles—among them eighteen ground-beetles

(Harpelini), and a click-beetle; four, four caterpillars; two, chinch-bugs; two, eleven chrysalids of *Dryocampa senatoria* (?); one, a wasp; two, cherries; one, grapes; one, acorns; and one, elder berries. Several pieces of egg-shell were taken from the stomach of one specimen. Among those which had eaten ants, four had eaten respectively 252, 220, 200 and 162 of these insects. The stomachs of those which had eaten chinch-bugs contained thirty-six and seventy-four each. In the stomach of one which had eaten beetles there were eleven ground-beetles (*Anisodactylus*).

Wood-lice, ants and their pupæ and larvæ; cherries and berries of sour gum (Wilson). Ants, caterpillars, beetles, various fruits and corn (Audubon). Insects, berries and grains (Samuels). Of eight specimens examined by Prof. Forbes, all had eaten both wasps and ants.

FAMILY STRIGIDÆ: OWLS.

FIG. 137.



GREAT HORNED OWL (*Bubo Virginianus*). After Bd., Br. and Ridg.

153. *ALUCO FLAMMEUS PRATINCOLA* (BP.), COUES. **AMERICAN BARN OWL.**
GROUP II. CLASS c.

This species appears to be a rare bird in all the Northern States east of the Rocky Mountains, but farther south it is more abundant. Dr. Hoy records it as occurring near Racine.

Far too little is yet definitely known in regard to the real economic relations of nearly all birds of prey to satisfactorily determine whether they render more of service than of injury. In the "*Report on the practicability of establishing a close time for the protection of Indigenous Animals*," there is no doubt expressed in regard to the great utility of Owls, it being there affirmed that these birds are of the greatest use to the agriculturist in destroying the small mammals which injure his crops. However serviceable Owls may be to the agriculturist in England in destroying noxious mammals, the evidence in regard to the food of the Little Barn Owl, as determined by Dr. Altum, indicates that it is nearly as destructive to useful animals as it is to those which are detrimental. It will be seen that of the remains of 2,562 small animals discovered in the pellets which Dr. Altum examined, there were the remains of 1,204 Bats, Shrews, Moles and birds, all of which are insectivorous, and, therefore, presumably beneficial — and especially so since the mammals are nocturnal. In view of the fact that field-mice do not appear to become more abundant in thickly settled districts, as Hawks and Owls diminish in numbers, it is evident that there are other powerful checks which oppose them, and that an Owl or Hawk which feeds extensively upon bats, shrews, moles or birds must be regarded as injurious so far as its food is concerned, even though it may be more destructive to rats and mice than to these animals. The destruction of one field-mouse cannot compensate for the life of a bat or mole.

Dr. Brewer regards the Barn Owl as one of our most useful birds, and attributes its rarity in the Eastern States, and its thoughtless destruction, to shortsighted and mistaken prejudice. It is certainly to be hoped that the opinion of Dr. Brewer will be speedily confirmed, but facts, so far as we know them, and the great need of a more ample abundance of small birds, do not appear to bear him out.

Food: The stomach of one contained four mice (Wilson). Shrews, moles and field-mice (De Kay). Principally field-mice and rats (Audubon). Rats, mice and other mischievous and injurious vermin (Brewer).

154. BUBO VIRGINIANUS (G.M.), BP. **GREAT HORNED OWL. GROUP III.**
CLASS b.

This powerful bird is a resident throughout the year and chiefly a forest bird. It is quite common, and often killed out of mere curiosity. Dr. Brewer states that it is one of the most destructive of the depredators upon the poultry yard, far surpassing in this respect our Hawks. All of its mischief is done at night, when it is almost impossible to detect and punish it.

Food: Chipmunks, striped-snakes and water-snakes.

Young rabbits, squirrels, rats, mice, Partridges, the Golden-winged Woodpecker, common Crow, and various other small birds and poultry (Wilson). The larger birds, poultry, and fish cast upon the shore (De Kay). Rabbits, Grouse and other birds; is very destructive to poultry roosting on trees (Samuels). Chiefly the larger gallinaceous birds, several species of ducks, hares, young opossums, squirrels, and fish cast upon the shore (Audubon). Shrews and *arvicolæ* (Mr. Ross). Rabbits, mice, muskrats and Partridges (Mr. Gunn). Mr. Street, in experimenting upon a young caged bird, found it especially fond of fish and snakes, and was led to conclude that it does not prey upon quadrupeds larger than the hare, that it is rarely able to seize small birds, and that reptiles and fish form no inconsiderable portion of its food (Brewer). Dr. Hoy mentions an instance in which a fine Red-shouldered Hawk was killed and eaten by a caged specimen of this species.

Bubo Virginianus arcticus is a northern form which occurs rarely as a winter visitant. Dr. Hoy knew of one of these birds which carried off from one farm in the space of a month not less than twenty-seven individuals of various kinds of poultry before it was shot.

155. SCOPS ASIO (LINN.), BP. **RED OWL; MOTTLED OWL; SCREECH OWL.**
GROUP III. CLASS b.

Common. Resident. It is a frequent visitor to dwellings, but its small size renders it harmless to poultry, except when young. It feeds extensively upon insects, but some of these are diurnal and preyed upon by many other birds. Its familiarity, its haunts and its destruction of small birds are such that should it be found possible for our feathered friends to assume an over-abundance, it may be expected to prove very effectual in holding them within proper bounds.

Food: The stomach of one specimen examined was distended with ten large caterpillars and six grasshoppers, and contained a few small seeds.

Mice, small birds, crickets and beetles (Wilson). Small birds, mice and insects (Cooper). Mice and insects (De Kay). Injurious night-flying moths and beetles, small mammals, and occasionally birds (Samuels). Small birds, field-mice and moles (Audubon). Golden-winged Woodpecker (Mr. A. Fowler). Mice, beetles and vermin; occasionally, when they have young, small birds (Brewer). Nuttall mentions finding in a hollow stump which contained a single brood of this species several Bluebirds and Song Sparrows.

156. ASIO WILSONIANUS (LESS.), COUES. **AMERICAN LONG-EARED OWL.**
GROUP II. CLASS c.

This Owl is quite common, and frequents cultivated fields and the vicinity of dwellings at night. During the day it affects groves and woods, where it nests.

Food: Three out of four specimens examined had their stomachs entirely empty; in the fourth there were a few hairs of some mouse.

Entirely small mammals; it is doubtful if they ever attack poultry (Cooper). Smaller quadrupeds and birds (De Kay). Chiefly quadrupeds, insects, and, to some extent, small birds; Audubon mentions finding the stomach of one stuffed with feathers, hairs and bones (Brewer).

157. ASIO ACCIPITERINUS (PALL.), NEWT. **SHORT-EARED OWL.** GROUP II.
CLASS c.

Mr. Nelson speaks of this species as the most abundant Owl in Northeastern Illinois, where it arrives in large numbers the first of November, and disperses through the state. It frequents marshes and prairies in preference to woodlands, and is thus brought especially in contact with field-mice.

Food: It is said to be an excellent mouser (Wilson). Almost exclusively field-mice and hard-winged insects (De Kay). Pellets disgorged by this Owl, and found near its nest, consisted of the bones of small quadrupeds, mixed with hair and the wings of beetles (Audubon).

158. STRIX CINEREA, GM. **GREAT GREY OWL.** GROUP III. CLASS I

While this species is only a winter resident, its destructiveness to small birds unites it closely to agricultural interests even when it is in its summer home.

Food: Mr. Dall found its food to consist principally of small birds. At one time he took from the stomach of one of these birds no less than thirteen crania

and other remains of the Pine Linnet (*Ægiothus linarius*). Mr. Richardson states that it feeds principally upon hares and other small quadrupeds (Brewer). Audubon mentions a caged bird which fed readily upon fish and small birds.

159. *STRIX NEBULOSA*, FORST. **BARRED OWL.** GROUP III. CLASS b.

This Owl is a resident throughout the year and perhaps is our most abundant species. It is a woodland species, and, though nocturnal, is often abroad by day.

Food: Two out of three specimens examined had their stomachs empty; the third had in its stomach the crania of two mice.

Fowls, Partridges, young rabbits and mice (Wilson). Rats, mice and the smaller birds (De Kay). Small birds, field-mice, reptiles, and frogs (Samuels).

160. *NYCTEA SCANDIACA* (LINN.), NEWT. **GREAT WHITE OR SNOWY OWL.** GROUP II. CLASS c.

This large, imposing species is a winter resident and sometimes quite common. It is said to hunt by day as well as by night, and Mr. Samuels has seen one pursue and capture from a flock a Snow Bunting (*P. nivalis*). Audubon speaks of its habit of catching fish.

Food: It is said to feed upon hares, mice, grouse, ducks, fish and carrion (Wilson). Rabbits, White Grouse, mice and other small animals (Cooper). Fish and small quadrupeds (De Kay). Fish thrown up by the tide, wounded sea fowl and other birds, and dead animals (Samuels). Fish, hares, squirrels, rats, and muskrats, which it sometimes takes from the traps of hunters, and *Anas boscas* (Audubon).

161. *SURNIA FURNEREA* (LINN.), RICH. & SW. **AMERICAN HAWK OWL.** GROUP III. CLASS b.

This is the most diurnal of all our Owls, and, like other birds, retires to roost at night, but it hunts to some extent during the twilight. It is known to capture birds, both large and small, and Mr. Samuels states that a specimen was obtained in Vermont on a woodpile, where it was eating a Woodpecker which it had just captured.

Food: It feeds chiefly upon field-mice (*Arvicola*); also upon small birds and grasshoppers (Coues). Partridges and other birds (Wilson). Mice and small birds (De Kay). Woodpeckers and other small birds, and mice (Samuels). In summer, principally mice and insects; in winter, Ptarmigan, upon flocks of which it is a constant attendant (Richardson). Principally mice (Mr. Dall).

162. *NYCTALA TENGMALMI RICHARDSONI* (BP.), RIDG. **RICHARDSON'S OWL.** GROUP III. CLASS b.

This species is reported by Dr. Hoy to have been taken in Wisconsin. It is, however, described as the most decidedly boreal of any of the American Owls, and Mr. Nelson does not include it in his "Birds of Northeastern Illinois." Sir John Richardson speaks of its very great abundance in the Saskatchewan country. Mr. Ross says that it is a fierce bird and creates great havoc among the Linnets and other small birds.

Food: Its food is principally insects, although mice and the smallest birds are also captured (Coues). Linnets and other small birds (B. R. Ross).

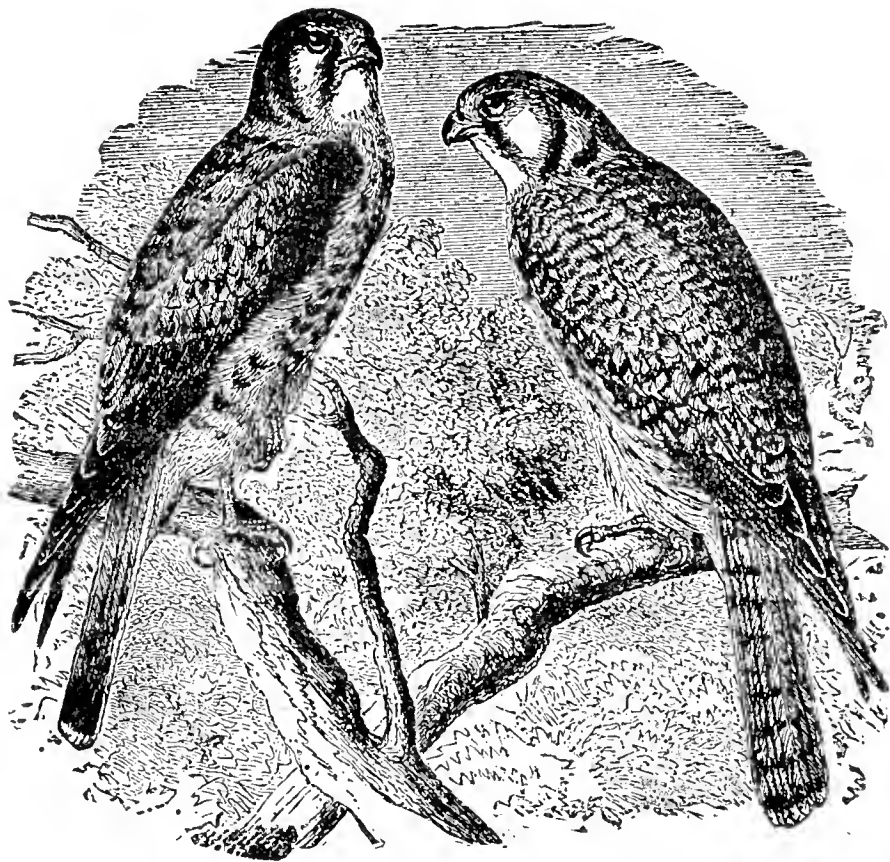
163. *NYCTALA ACADICA* (GM.), BP. **ACADIAN OR SAW-WHET OWL.** GROUP II. CLASS c.

This exquisite little species does not appear to be abundant anywhere in the United States. I have obtained but a single specimen, and this was found dead near Whitewater, December 10, 1877. Mr. Nelson speaks of its not uncommon occurrence in Illinois, and over a dozen specimens were taken in the city of Chicago within two years. It is seldom abroad by day and frequently comes about dwellings, but it is too diminutive to be destructive to poultry.

Food: It is a dexterous mouser (Wilson). Small birds and insects (De Kay). Chiefly insects (Coues).

FAMILY FALCONIDÆ: HAWKS.

FIG. 138.



SPARROW HAWK (*Falco sparverius*). After Bd., Br. and Ridg.

164. *CIRCUS CYANEUS HUDSONIUS* (LINN.), COUES. **MARSH HAWK; HARRIER.** GROUP II. CLASS c.

The Harrier is by far our most abundant representative of this family, and a summer resident. Most of its time is spent in soaring over treeless tracts in quest of food, but marshes and the vicinity of water are its favorite resorts. It lacks the spirit and dashing movement of Falcons, and for this reason is not as dangerous to mature birds; the young, however, of species which breed in marshes and meadows may suffer greatly from its depredations. Wilson states that it makes sad havoc among the Rice Buntings in the South, and Audubon accuses it of feeding extensively upon the Swamp Sparrow in some localities, while Dr. Coues has found it particularly fond of frogs. It rarely molests poul-

try, but, when pressed by hunger, has been known to attack Partridges, Plovers, and even Teal.

Food: Of two specimens examined, one had in its stomach four, and the other two meadow-mice (*Arvicola*). I saw one capture a striped gopher (*Spermophilus tridecem lineatus*), and another, a Red-winged Blackbird. Insects, especially grasshoppers, frogs, small quadrupeds and reptiles (Coues). Mice and the Rice-bird in the south (Wilson). Small birds, mice, occasionally poultry, snakes and grasshoppers (Cooper). Field-mice (Samuels). Swamp Sparrow, Chipping Sparrow and Virginia Rail (Audubon). Small birds and mice (Mr. Gunn). An indiscriminate feeder upon snakes, fish, and even worms; I took two green snakes from the stomach of one of them (Downes). Mice, lizards, serpents and other reptiles, frogs, and occasionally poultry (De Kay). I have lately seen this bird digging open the ridges formed by *Scalopus aquaticus*, and I once saw the bird overtake and kill the beast, but it did not eat it (Charles C. Abbott, *Am. Nat.*, IV, 377).

165. *ELANOIDES FORFICATUS* (LINN.), COUES. **SWALLOW-TAILED KITE.**

GROUP I. CLASS b.

This species is rare in the eastern part of the state, but is said to occur more frequently along the Mississippi, where it is a summer resident. It is extremely swift and expert in its aerial movements, but I find no records which indicate that it is ever destructive to small birds.

Food: Cicadas, lizards and small green snakes (Wilson). Snakes, lizards and other reptiles (De Kay). Catches insects over the burning fields of the south (Major Le Conte). They feed upon dragon-flies, but their principal food is grasshoppers, grass-caterpillars, pupæ of locusts and the locusts themselves, snakes, lizards and frogs (Audubon). Grasshoppers and the grubs of wasps, to obtain which it carries the nest to a tree and picks out the grubs at its leisure (Dresser). Snakes, particularly a little green one (*Leptophis stivæ*), and the different species of *Eutania*; later in summer largely insects, especially neuroptera (Ridgway). It preys upon swarms of bees (R. Owen, *Ibis*, 1860, p. 24).

Ictinia Mississippiensis has been noted in the state, but later observations have not detected it.

166. *ACCIPITER FUSCUS* (GM.), BP. **SHARP-SHINNED HAWK; PIGEON HAWK.** GROUP II. CLASS c.

This spirited little Hawk is common during the fall migrations, and a few are summer residents. Wilson states that it flies with almost unaccountable velocity, and seems to take its prey by surprise or by mere force of flight. "Many have been the times," says Audubon, "when watching this vigilant, active and industrious bird, I have seen it plunge headlong among the brier patches of one of our old fields, in defiance of all thorny obstacles; and, passing through, emerge on the other side, bearing off, with exultation, in its sharp claws, a Finch or Sparrow which it had surprised when at rest." The same writer has witnessed two or three of these Hawks, acting in concert, kill and devour a Golden-winged Woodpecker. It appears to be chiefly a woodland species, but sometimes comes about dwellings for domestic pigeons and young chickens. Nuttall knew of one of these Hawks which carried off thirty or forty chickens from a single yard.

Food: The single specimen which I have examined had nothing in its stomach. The Scarlet Tanager and other small birds, lizards and mice (Wilson). They

have been known to take young chickens (Cooper). Birds, reptiles, insects and poultry (De Kay). Principally birds (Samuels). Frequently destructive to doves and young poultry (Nuttall). Small snakes and insects (Brewer). Principally snakes and insects (Coues). Swamp Sparrow and Chipping Sparrow (Audubon).

167. *ACCIPITER COOPERI*, BP. **COOPER'S HAWK; CHICKEN HAWK.**
GROUP III. CLASS b.

This Hawk is much larger, more audacious, feeds less upon insects, and is more destructive to poultry than its congener. Its flight is described as silent, gliding and swift, exceeding that of the Wild Pigeon. It is said to secure its prey by giving open chase, and to dive down upon its quarry with almost incredible velocity. With such powers and tendencies as these, and living constantly among our most useful birds, which it follows south to their winter homes, this Hawk is evidently a most dangerous species.

Food: Often comes to the very door for poultry (Wilson). Chiefly the smaller birds (De Kay). Hares, squirrels, poultry, Grouse, Ducks, small birds, snakes and other reptiles, grasshoppers and crickets (Samuels). The Ruffed Grouse (Brewer). Many Quails and young Grouse, which, together with poultry, constitute their principal fare (Dr. Hoy). It attacks and destroys hares, Grouse, Teal, and even the young of larger ducks, beside capturing the usual variety of smaller birds and quadrupeds, and it occasionally seizes upon insects (Coues).

168. *ASTUR ATRICAPILLUS* (WILS.), BP. **AMERICAN GOSHAWK.** GROUP III.
CLASS b.

This large, powerful species is a somewhat uncommon winter resident. December 5, 1877, one of these birds was taken while it was making an attack upon the inmates of a dove-cot. The day before the same Hawk succeeded in capturing, by direct chase, a dove, which it bore off for its morning repast. Its flight is extremely rapid and protracted; and Audubon has seen it dash into a flock of Purple Grackles and before they could disperse secure four or five victims. So skillful is it said to be in capturing Snipe on the wing, that these birds court security by skulking upon the ground rather than taking flight, when they observe the approach of their enemy.

Food: In February, 1881, I obtained a specimen which had eaten a rabbit.

Doves and poultry, Ducks, Pigeons, hares, etc. (De Kay). Canada and Ruffed Grouse, Purple Grackles, Pigeons, Mallards and other wild Ducks, Snipe, squirrels, and hares (Audubon). Grouse (Mr. Street). Ducks, Pigeons and poultry (Mr. Downes). It feeds largely upon White Ptarmigan (Mr. Dall). Poultry (Dr. Hoy).

169. *FALCO PEREGRINUS*, TUNSTALL. **PEREGRINE FALCON; DUCK HAWK.**
GROUP III. CLASS a.

This species rarely occurs except as a migrant, and as such it is not very common. It is a powerful bird, and its gigantic talons are commensurate with its audacity and courage. It can out-fly the Wild Pigeon, and the short turnings of the Swallow do not secure it against fatal attacks from this bird.

Food: Ducks, Geese, Plovers, and other small birds (Wilson). Swallows, Ducks, and other water-fowl (Cooper). It attacks the Sparrow Hawk and anything from the size of a Mallard down to small birds. It captures the Dusky Petrel (Col. Grayson). Wild Pigeon, water-fowl, and small birds (Richardson). The Mallard and other Ducks, Snipe, Blackbirds, wild and domestic Pigeons, and occasionally dead fish (Audubon). Blue-winged Teal (Dr. Hoy).

170. *FALCO COLUMBARIUS*, LINN. PIGEON HAWK. GROUP III. CLASS b.

This spirited, swift-winged little Hawk has been described as one of the most destructive of its tribe. It captures birds upon the wing with little difficulty, and is so audacious as to destroy Ptarmigan birds larger than itself. Its sagacity leads it to take advantage of gregarious species, and it follows all our birds in their migrations north and south. Dr. Hoy states that those which nest near Racine, regularly, morning and evening, visit the lake shore in quest of Bank Swallows which they seize with great dexterity. It appears to breed, as a rule, north of the United States, but Mr. Nelson mentions it as a rare summer resident in Illinois.

Food: Small birds and mice. It often follows flocks of Blackbirds, Pigeons and Robins — many of which become its victims (Wilson). It catches birds as large as itself, follows gregarious species, and preys much upon mice, gophers, and squirrels (Cooper). Destroys Robins, Bluebirds and Sparrows in great numbers, and attacks the Pigeon and Dove (Samuels). Robin, Wild Pigeon, Golden-winged Woodpecker, Yellow-billed Cuckoo, and pursues Snipe and Teal (Audubon). Bank Swallows (Dr. Hoy). Feeds upon small birds, but is not troublesome to farmers (Mr. Downes).

Falco Richardsonii is said to have been taken near Racine.

171. *FALCO SPARVERIUS*, LINN. SPARROW HAWK. GROUP II. CLASS c.

Except the Marsh Harrier, no Hawk is as abundant as this little Falcon. It is more abundant in wooded districts than in prairie sections, and the borders of woodlands and fields with scattering trees are its favorite resorts. It is too small to be destructive to poultry, except when very young, but it is none the less dangerous on this account to our most useful small birds. It captures birds on the wing with little difficulty, is more than a match for the Brown Thrasher, and tears open the bottle-shaped nest of the Cliff Swallow to secure the inmates. When autumn comes and our birds go south, "in their rear rushes the Sparrow Hawk." I have seen this species come close to a house and attempt to capture one of a brood of young Robins which had recently left the nest. At another time a Song Sparrow only escaped its pursuer by diving into a brush pile; and once one of these Hawks flew close over my head, bearing off a small bird in its talons. But its food does not consist of birds alone. Indeed, it consumes so many noxious insects, and is such an excellent mouser, that Dr. Coues says it is to be held a benefactor to the agriculturist, and this view is also entertained by Dr. Cooper. My own notes, viewed with reference to the conditions stated in the Introduction, do not, however, point in this direction. It will be seen that it is very destructive to noxious insects, but it should be observed that these insects are destroyed in great numbers by many less dangerous species. As an insect destroyer it is not, therefore, especially needed. Small birds are not so abundant at present as to demand the assistance of a large number of Birds of Prey to hold them in check; and plows, cultivators, reapers, mowers and horse-rakes work such havoc among field-mice as to preclude their ever becoming excessively abundant in regions where these implements are used. For this reason the service which Rapacious Birds render by destroying mice in agricultural districts is not as great as it appears to be.

Food: Of seven specimens examined, two had eaten two mice; four, twenty-five grasshoppers; three, twenty-five crickets; one, six beetles; one, five moths; and one, two hairy caterpillars (*Arctia*). One was seen to take a young Robin from the nest and one to capture another bird not identified.

The young are fed upon grasshoppers, mice, Robins, Snowbirds and small birds. The food of the old bird is the same with the addition of lizards and occasionally chickens. When grasshoppers are plenty these form a considerable part of its food (Wilson). Chiefly grasshoppers, mice, gophers, etc. (Cooper). Small birds, but chiefly quadrupeds, reptiles and insects (De Kay). Small birds, young chickens, mice, lizards, snakes and grasshoppers (Samuels). Sparrows, mice, grasshoppers and crickets (Audubon). The Cliff Swallow, Field Sparrow and other birds, mice, lizards, snakes and grasshoppers (Brewer). Sparrows, the Brown Thrush and other birds, lizards (*Sceloporus*), field-mice and noxious insects (Coues). Small birds, field-mice, shrews and small reptiles (E. Michener).

172. *BUTEO BOREALIS* (GM.), VIEILL. **RED-TAILED BUZZARD; HEN HAWK.** GROUP II. CLASS c.

In speaking of this Hawk and its close allies Dr. Coues says: "They are unfitted, both by their physical organization and temperament, for the daring feats that the Falcons and Hawks execute, and usually prey upon game disproportionate to their size, which they snatch as they pass along. I have, however, found nearly the whole of a rabbit in its craw." While such sluggish species are far less liable to be destructive to mature birds, they may be expected to be proportionally even more dangerous plunderers of birds' nests than the swifter winged species. Necessarily restricted to slow-moving prey, while their appetite for flesh remains, they are forced to a diligent and scrutinizing search, and are thus likely to be brought in contact with the hidden nests of birds. Of two Hawks which prey upon birds, the addicted nest-robber is the more dangerous.

Food: Hens, frogs and lizards (Wilson). Small quadrupeds and poultry (De Kay). Very destructive to poultry, and feeds upon the Ruffed Grouse and hares (Samuels). Small quadrupeds, small birds, and snakes (Brewer). Marmots (Richardson).

173. *BUTEO LINEATUS* (GM.), JARD. **RED-SHOULDERED HAWK.** GROUP III. CLASS b.

A common summer resident, keeping closely to the woods except during the migrations.

Food: One specimen examined had eaten only grasshoppers and beetles.

Larks, Sandpipers, Ring-necked Plovers and Ducks (Wilson). Partridges, Pigeons, wounded Ducks, Red-winged Blackbirds, squirrels, cotton-rats, meadow-mice and frogs (Audubon). Small birds and quadrupeds (De Kay). Frogs, cray-fish and insects, rarely troubling large game (Nuttall). It is a dexterous catcher of frogs, with which it sometimes so stuffs itself that it can hardly fly (Brewer). Frogs, cray-fish and insects (Nuttall).

174. *BUTEO SWAINSONI*, BP. **SWAINSON'S BUZZARD.** GROUP II. CLASS c.

Not common. A summer resident.

Dr. Coues says of this species: "Though really strong and sufficiently fierce birds, they lack the 'snap' of the Falcons and Asturs; and I scarcely think they are smart enough to catch birds very often. I saw one make the attempt on a Lark Bunting. The Hawk poised in the air, at a height of about twenty yards, for fully a minute, fell heavily with an awkward thrust of the talons, and missed. . . . They procure gophers, mice and other small quadrupeds, both by waiting patiently at the mouth of the holes, ready to claw out the unlucky

animals the moment they show their noses, and by sailing low over the ground to pick up such as they may find away from home. But I question whether, after all, insects do not furnish their principal subsistence. Those that I shot after midsummer all had their craws stuffed with grasshoppers."

Food: Two whole toads were found in the stomach of one (Richardson). Three toads were found in the stomach of one (Blakinston). Rabbits, squirrels, mice, ducks and white-fish (Dall). Its principal food is grasshoppers, prairie-rats and small birds (Brewer). Gophers, mice, small quadrupeds and grasshoppers (Coues).

Mr. W. Hoffman records an instance where an *Icterus Bullocki* nested within eight feet of the nest of a pair of these Hawks, and states that the birds appeared to live together in harmony.

175. *BUTEO PENNSYLVANICUS* (WILS.), BP. **BROAD-WINGED BUZZARD.**
GROUP II. CLASS c.

Common in the northern portions of the state, where it breeds in the heavy timber.

Food: A specimen taken in Clark county had in its stomach seven large lamellicorn beetles and two grasshoppers, together with a few small fragments of bones.

The White-throated Sparrow and other small birds, squirrels and insects (Wilson). Frogs and species of common field locusts (William Cowper). Small birds and quadrupeds, wood frogs and snakes (Audubon). Chickens, ducklings, animals and insects. It only attacks birds of a weak nature (Brewer).

176. *ARCHIBUTEO LAGOPUS SANCTI-JOHANNIS* (GM.), RIDG. **AMERICAN ROUGH-LEGGED HAWK.** GROUP III. CLASS b.

This is a northern species, and probably but rarely a summer resident. A few are said to spend mild winters in the state. Mr. Nelson states that it arrives in large numbers in October in Northeastern Illinois and after a few weeks passes further south. Its plumage is owl-like, its flight noiseless, and its search for food often continued long into the evening.

Food: Mice, lame ducks, lizards and frogs (Wilson). It rarely attacks poultry (Cooper). Mice, small birds, frogs, etc. (De Kay). Principally mice, moles and other small quadrupeds and frogs (Audubon). Mice, wounded ducks and small birds (Samuels). Rats (R. H. and F. H. Storer).

177. *PANDION HALIAETUS* (LINN.), SAV. **FISH HAWK; OSPREY.** GROUP II.
CLASS b.

This species is not uncommon along the Mississippi and St. Croix rivers, and I observed several among the numerous lakes of Lincoln county in October of 1877. It is an excellent fisherman and appears to subsist wholly upon the members of the finny tribe. It even allows small birds to nest unmolested among the coarse sticks of its own nest. So far as its food is concerned, it is wholly injurious, but its destruction of fish, by simply feeding upon them, is not of so great moment as to demand an interference with them at present. Should they be found to breed troublesome parasites which are destructive of food-fish, then it may be found necessary to hold their numbers at the minimum.

178. *AQUILA CHRYSÆTUS* (LINN.), CUV. **GOLDEN EAGLE.** GROUP III.
CLASS b.

A regular winter visitor, but only in small numbers.

Food: Living quadrupeds, birds, etc., but it rarely touches a dead body (De Kay). Young fawns, raccoons, hares, wild turkeys and other large birds; also carrion (Audubon). Ducks, mice, fawn of the reindeer, Partridges and other animals (McFarland). Carrion (E. W. Nelson).

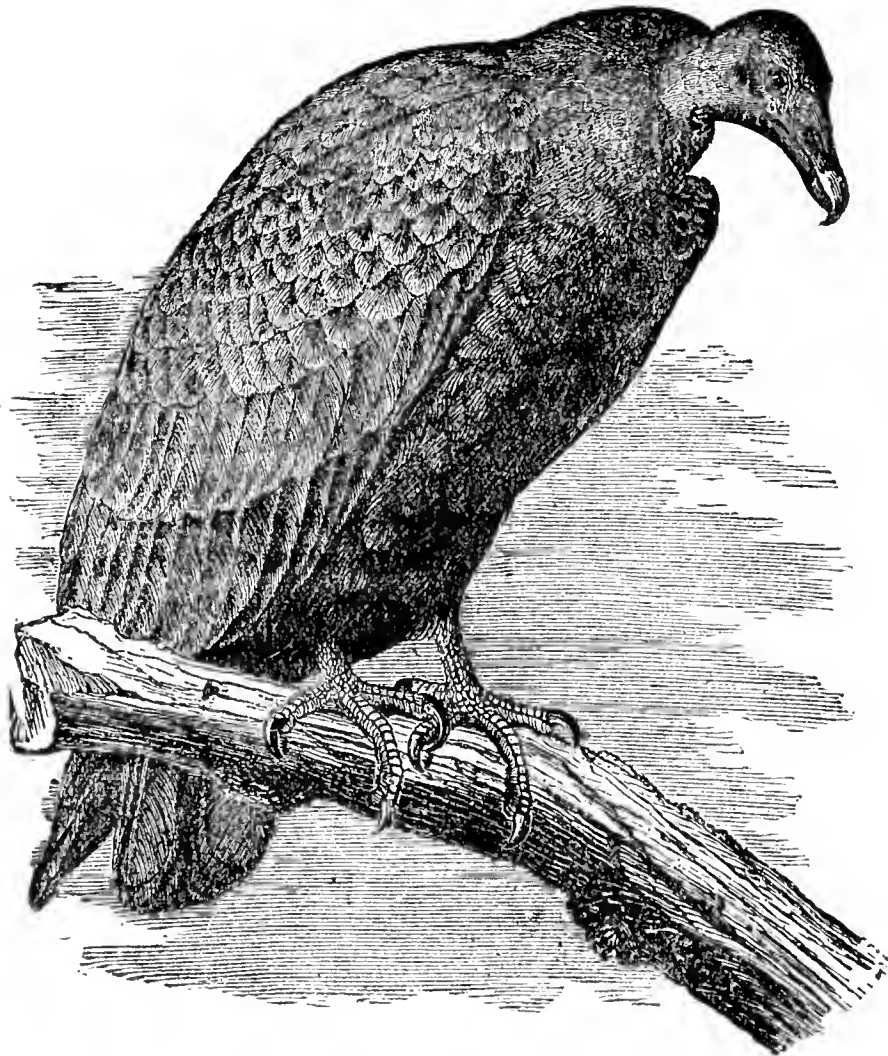
179. *HALIAETUS LEUCOCEPHALUS* (LINN.), SAV. **WHITE-HEADED EAGLE.**
GROUP III. CLASS b.

This species is resident throughout the year and common in the northern portion of the state.

Food: Ducks, Geese, Gulls and other sea-fowl and carrion (Wilson). Weakly lambs, calves, and other animals (Cooper). Fish, wild fowl and small quadrupeds (De Kay). Wild Geese and other wild fowl, small animals, and is very partial to fish, which it takes from the Osprey (Samuels). It fishes when no Fish Hawk is around (S. S. Haldeman, Am. Nat., Vol. I).

FAMILY CATHARTIDÆ: AMERICAN VULTURES.

FIG. 139.



TURKEY BUZZARD (*Cathartes aura*). After Bd., Br. and Ridg.

180. *CATHARTES AURA* (LINN.), ILL. **TURKEY BUZZARD.** GROUP II. CLASS a.

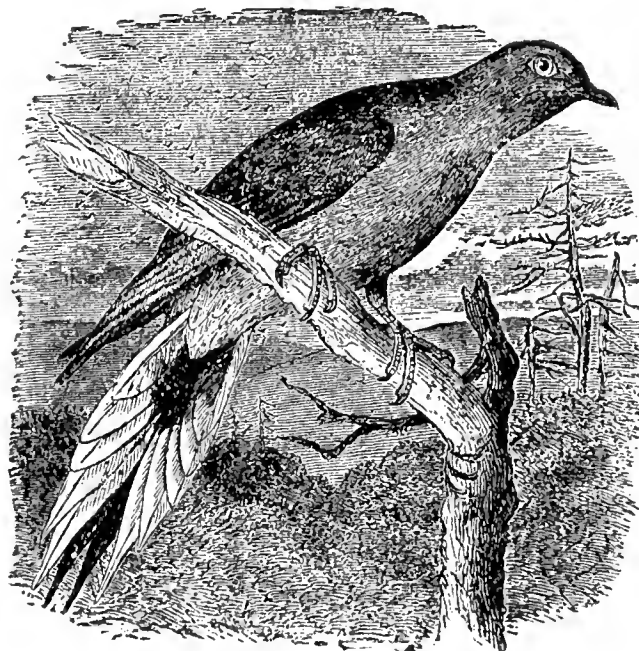
Reported as occurring in the state by Dr. Hoy.

Mr. Trippe states that it is abundant in Minnesota and that it breeds there. From this statement it is probable that it occurs frequently along the Mississippi in Wisconsin, but in the eastern portion of the state it is very rare. Since writing the above I have found it at River Falls. Although generally a scavenger, the Turkey Buzzard, when pressed by hunger, kills young pigs and lambs and other weak and disabled animals. "One excellent service which the Turkey Vultures render," says Dr. Coues, "in warm countries, is the destruction of alligators' eggs." It is also accused of sucking the eggs and devouring the young of many species of Herons. Such tendencies as these render a bird like this of doubtful utility in a climate like ours.

Food: Carrion (Wilson). The carcasses of animals (Cooper). Carrion, disabled animals and eggs of birds, etc. (De Kay). Eggs and young of many species of Herons (Audubon). Skunks in traps (Am. Nat., Vol. XII, p. 821, W. Kite).

FAMILY COLUMBIDÆ: PIGEONS.

FIG. 140.

WILD PIGEON (*Ectopistes migratorius*). After Bd., Br. and Ridg.181. *ECTOPISTES MIGRATORIUS* (LINN.), SW. **WILD PIGEON; PASSENGER PIGEON.** GROUP I. CLASS c.

Food: Acorns and other nuts, grain, buckwheat and various small seeds are its usual food. From the stomach of one specimen, however, were taken two large caterpillars — one of which was an *Edema albifrons*, — one harvest-man, nine black crickets and four grasshoppers.

Buckwheat, hemp-seed, Indian corn, hackberries, huckleberries, acorns and chestnuts (Wilson). Beech-nuts, acorns, berries, rice and seeds (De Kay). Acorns, beech-nuts, berries, grains and weed-seeds (Samuels). Acorns (Forbes).

182. *ZENAIIDURA CAROLINENSIS* (LINN.), BP. **CAROLINA DOVE.** GROUP I.
CLASS c.

A very common summer resident but never sufficiently gregarious to be injurious to crops to any noteworthy extent.

Food: Seeds of various weeds, buckwheat, rye, wheat and oats. In the stomach of one bird I counted 4,016 seeds of the pigeon-grass and twelve small snails; the latter were probably taken as gravel. Of nine specimens examined, eight had eaten the seeds of weeds; three, wheat; two, rye; and one, oats.

Buckwheat, hemp-seed, corn, berries, acorns, and occasionally peas (Wilson). Grains and berries (Samuels). Seeds, grain, buckwheat, Indian corn (Brewer). Of four specimens examined, four had eaten seeds of weeds; two corn; and one, wheat (Forbes).

FAMILY TETRAONIDÆ: GROUSE, ETC.

FIG. 141.



QUAIL (*Ortyx Virginiana*). After Bd., Br. and Ridg.

183. *CANACE CANADENSIS* (LINN.), BP. **SPRUCE PARTRIDGE; CANADA GROUSE.** GROUP I. CLASS c.

A very common resident in the coniferous forests of Northern Wisconsin, where it is partial to the swamps.

Food: Buds and cones of spruce and larch (De Kay). Buds, seeds and foliage of evergreens (Samuels). Berries, young twigs and blossoms of several species of plants and berries of the Solomon's Seal (Audubon).

184. *PEDICECETES PHASIANELLUS COLUMBIANUS* (ORD.), COUES. **SOUTHERN SHARP-TAILED GROUSE.** GROUP I. CLASS c.

This species is resident from Berlin northward, and was abundant in the vicinity of Lake Flambeau in October, 1877.

Food: Tender leaves, thorn-apples, rose-hips, wheat and grasshoppers.

In winter, buds of elder, poplar, etc. (Cooper). In the fall, chiefly grasshoppers, only varied with a few flowers, weed-tops, succulent leaves, and an occasional beetle or spider; in winter, chiefly berries of the cedar, and buds of the poplar and cottonwood or willow (Coues).

185. *CUPIDONIA CUPIDO* (LINN.), BD. **PINNATED GROUSE; PRAIRIE HEN.** GROUP I. CLASS b.

A common resident, but rapidly disappearing before the zeal of sportsmen. From early in the spring until after the middle of August this species is confined almost exclusively to meadows, and during this long period it is probable that its food consists very largely of insects, and that the services it renders by holding in check cut-worms and grasshoppers are very great, while its injurious effects are almost inappreciable. There are but few sections in the state where the destruction of the Prairie Hen should not be entirely prohibited, at least for a term of years.

Food: Insects of various kinds, wheat, corn, buckwheat and other grains, weed- and grass-seeds and some vegetable material.

186. *BONASA UMBELLA* (LINN.), STEPH. **RUFFED GROUSE; PARTRIDGE.** GROUP I. CLASS c.

The Ruffed Grouse, or Partridge, as it is often called, is a common resident during the whole year in all portions of the state suitable to its tastes. Unlike the Prairie Chicken, this species is emphatically a woodland bird, though it is not confined to heavily timbered districts. The numerous dense groves of small trees bordering the prairies and in thickly settled districts are the haunts which please it well. From these resorts it rarely invades cultivated fields. This bird appears to be very fond of the buds of certain trees, upon which it subsists to a considerable extent during the cold months, but it is not likely to become so abundant as to injure shade or forest trees to any appreciable extent.

Food: Of six specimens examined, two had eaten twenty-four caterpillars; one, the grub of a beetle; one, two grasshoppers; one, seven harvest-men; one, fruit; one, foliage; one seeds; one, partridge-berries; and three, buds.

A young chicken, probably not over a week old, had in its stomach thirteen caterpillars, the grub of a beetle and seven harvest-men. An adult bird taken in October had in its stomach and crop three hundred and four white-birch buds.

Various vegetables, whortleberries, partridge-berries, blackberries, seeds of grapes and chestnuts. In winter, buds of alder and laurel, occasionally ants (Wilson). In summer, seeds, berries, grapes and other fruits. In winter, buds of various trees (De Kay). Various seeds, berries, grapes and insects; also leaves of evergreens, buds of trees, pieces of apples left on the trees, mosses and leaves of laurel (Samuels). In the spring, buds of various kinds of trees, especially birches. In Maine, buds of black birch. In summer, largely esculent berries, as raspberries, blueberries and huckleberries. In Maine they have been accused of visiting apple-orchards and fruit-buds (Brewer).

187. *LAGOPUS ALBUS* (GMELIN), AUD. **WILLOW GROUSE; WHITE PTARMIGAN.** GROUP I. CLASS c.

Dr. Hoy mentions the capture of two of these birds near Racine in 1846. It is doubtful if it ever occurs in Wisconsin except as a very rare straggler from its high-latitude home.

188. *ORTYX VIRGINIANA* (LINN.), BP. **QUAIL; BOB WHITE.** GROUP I. CLASS b.

This species is a common resident throughout the year, though far from being as abundant anywhere in the state as it was twenty years ago.

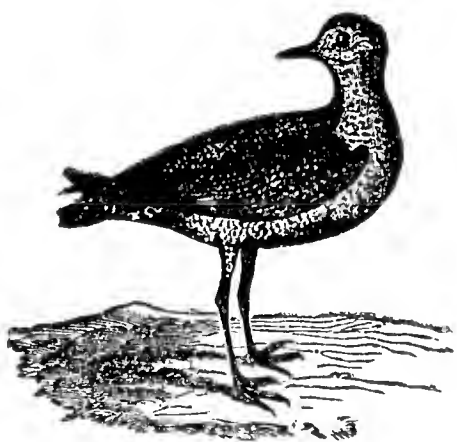
In its haunts, it stands on intermediate ground between the Ruffed Grouse and Prairie Chicken, occupying the borders of groves, hazel patches and open fields. When abundant in the fall, they congregate in flocks of from ten to thirty, often consisting of the two broods reared during the summer, and, if not molested, remain together until spring, moving about from field to field in the vicinity of the breeding grounds. I believe its destruction should be prohibited, for a number of years at least.

Food: Of two specimens examined, one had eaten one potato beetle, one elater, one ground-beetle (*Anisodactylus*), one grasshopper and five grasshopper eggs, probably from the grasshopper eaten; the other had eaten wild buckwheat, wheat and one beetle.

Grain, seeds, berries and buckwheat, also insects and berries (Wilson). Grains, seeds and berries (De Kay). Potato beetles (Am. Nat., Vol. VII, p. 247, A. S. Packard). One specimen examined by Prof. Forbes had eaten beetles, hemiptera (*Coreidae*), grasshoppers, spiders and vegetable materials. Plant-beetles were among the beetles; seeds of various plants and berries. In the fall and late summer, largely grasshoppers. Buckwheat, corn and all kinds of grain (Brewer).

FAMILY CHARADRIIDÆ: PLOVER.

FIG. 142.



GOLDEN PLOVER (*Charadrius dominicus*). From Tenney's Zoology.

189. *SQUATAROLA HELVETICA* (LINN.), CUV. **BLACK-BELLIED PLOVER.** GROUP I. CLASS c.

This is not a common species with us, and occurs only during the migrations. I have not myself met with it in the state.

Food: Worms, grubs, winged insects and berries (Wilson). Insects and berries (De Kay).

190. *CHARADRIUS DOMINICUS* (MÜLL). **AMERICAN GOLDEN PLOVER.**

GROUP I. CLASS c.

The Golden Plover, like the last, is only a migrant in the state. It is to be seen in the fall during the last of September and the early part of October, frequenting pastures in flocks of twenty or thirty, where it searches diligently for insects.

Food: Of three specimens examined, two had eaten five grasshoppers; two, nine beetles; and two, three caterpillars.

Small shell-fish and animalculæ, in the spring; in the fall, grasshoppers, various insects and berries (Samuels). Grasshoppers (Coues). Insects (Forbes).

191. *ÆGIALITES VOCIFERUS* (LINN.), CASS. **KILLDEER PLOVER.** GROUP I.

CLASS b.

So generally distributed throughout the state and so abundant is the Killdeer Plover, that even the Robin is scarcely better known than it. Unlike most of the waders, it is a summer resident with us, frequenting upland pastures, meadows and open fields, as well as the low flats adjoining bodies of water. I have known it to enter corn-fields infested with wire-worms, and to feed upon these pests.

The food, habits and haunts of the Killdeer are such as to bind it closely in economic relation with that all too small band of birds which, like the Meadow Lark, frequent the open, cultivated fields. On account of this relationship, the Killdeer Plover should be stricken from the list of "game birds," and encouraged to breed in greater abundance in cultivated fields and meadows.

Of thirteen specimens examined, ten had eaten fifty-seven adult insects, and three, ten angle-worms; five had eaten twelve larvæ, and in the stomach of one was found fifty-six grasshopper and cricket eggs.

Four birds had eaten fifteen ants; two, three caterpillars; one, three moths; one, a crane-fly; nine, twenty-eight beetles; one, a grasshopper; four, seven crickets.

One bird had eaten three wire-worms; two, three leaf-beetles; two, four curculios (*Breviostres*); one, a copris beetle.

Worms and aquatic insects (Wilson). Earth-worms, grasshoppers, crickets, beetles, small crustacea and snails (Audubon).

Of six birds examined by Prof. Forbes, all had eaten insects; two, caterpillars; three, beetles; one, cray-fish; and two, vegetable miscellany.

Of those eating beetles, one had eaten Histeridæ; two, plant beetles; and two, curculios.

192. *ÆGIALITES SEMIPALMATUS* (BP.), CAB. **SEMIPALMATED RING PLOVER; RING-NECK.**193. *ÆGIALITES MELODUS* (ORD.), CAB. **PIPING RING PLOVER; RING-NECK.** GROUP I. CLASS c

Both the Semipalmated and Piping Ring Plovers are reported as occurring in the state during the migrations, but I have met with neither alive in Wisconsin, nor *Ægialites melodus circumcinctus*, which Mr. Nelson reports as breeding along the lake shore in Northeastern Illinois.

FAMILY HÆMATOPODIDÆ: OYSTER-CATCHERS; TURNSTONES.

194. *STREPSILAS INTERPRES* (LINN.), ILL. **TURNSTONE.** GROUP I. CLASS c.

Dr. Hoy and Mr. Nelson speak of this species as a common migrant along the shore of Lake Michigan, but I have met no living specimens.

FAMILY RECURVIROSTRIDÆ: AVOCETS.

195. *RECURVIROSTRA AMERICANA* (GM.), AVOCET. GROUP I. CLASS c.

A rare migrant.

196. *HIMANTOPUS MEXICANUS* (MÜLL.), ORD. **BLACK-NECKED STILT.**
GROUP I. CLASS c.

A very rare visitant. Dr. Hoy reports having seen a small flock in 1847.

FAMILY PHALAROPODIDÆ: PHALAROPES.

197. *STEGANOPUS WILSONI* (SAB.), COUES. **WILSON'S PHALAROPE.**
GROUP I. CLASS c.

Wilson's Phalarope, though not abundant in the state, breeds in some numbers in various localities. They were abundant in July, 1876, on the marshes bordering Fox river below Princeton, where five young birds fully fledged were obtained.

Of the five specimens examined, three had eaten ten larvæ; three, six beetles; and two, four other insects.

Seeds and insects (Wilson). Small worms and fragments of very delicate shells (Audubon).

198. *LOBIPES HYPERBOREUS* (LINN.), CUV. **NORTHERN PHALAROPE;
RED-NECKED PHALAROPE.** GROUP I. CLASS c.

This species must be a rare migrant or of irregular occurrence in the portions of the state where I have collected. I have never met it alive.

199. *PHALAROPUS FULICARIUS* (LINN.), BP. **RED PHALAROPE.** GROUP I.
CLASS c.

The Red Phalarope appears to be an exceedingly rare migrant throughout the Mississippi Valley, but Mr. Nelson and Mr. Ridgway each mention it as occurring in Illinois, from which it may be supposed to pass through this state in its journeys.

FAMILY SCOLOPACIDÆ: SNIPES, ETC.

FIG. 143.

WILSON'S SNIPE (*Gallinago Wilsoni*). From Tenney's Zoology.200. PHILOHELA MINOR (GM.), GR. **AMERICAN WOODCOCK.** GROUP I.
CLASS c.

This game bird is not uncommon during the summer in damp woods bordering streams and other suitable localities. I have found it in the corn-field as well.

Food: Of two specimens examined, two had eaten three angle-worms; one, a beetle; and one, some vegetable matter.

Various larvæ and other aquatic worms (Wilson). Chiefly earth-worms and aquatic insects (De Kay). Worms and animalculæ procured from soft earth (Samuels). Earth-worms, grubs, etc. (August Fowler, Am. Nat., Vol. IV, p. 761).

201. GALLINAGO WILSONI (TEMM.), BP. **AMERICAN SNIPE; WILSON'S SNIPE.** GROUP I. CLASS c.

Wilson's Snipe, incorrectly called the English Snipe by many, is very abundant during the migrations, and doubtless breeds with us in considerable numbers, as they were abundant on the banks of the Fox river early in July of 1876. They frequent the wet, treeless banks of streams and low, wet meadows. During the fall they may be seen at times in flocks of from thirty to fifty.

Food: Of eleven specimens examined, ten had eaten thirty-five insects; three, fifteen beetles; one, a dipterous larvæ; and five, vegetable matter.

Larvæ of water insects, leeches, and occasionally grasshoppers and other insects (Samuels).

202. MACRORHAMPHUS GRISEUS (GM.), LEACH. **RED-BREASTED SNIPE; GRAY SNIPE.** GROUP I. CLASS c.

Dr. Hoy has observed this species near Racine. Mr. Nelson speaks of it as a rather common migrant in Northeastern Illinois. I have no personal acquaintance with it in the field.

Food: Snails (Wilson).

203. MICROPALAMA HIMANTOPUS (BP.), BD. **STILT SANDPIPER.** GROUP I.
CLASS c.

A rare migrant with which I have not met.

204. *EREUNETES PUSILLUS* (LINN.), CASS. **SEMIPALMATED SANDPIPER.**
GROUP I. CLASS c.

Mr. Nelson, in his report, speaks of this species as a very abundant migrant. Dr. Hoy regarded it as rare in 1852. I have not met with it.

205. *ACTODROMAS MINUTILLA* (V.), COUES. **LEAST SANDPIPER.** GROUP I.
CLASS c.

I have found this species a common migrant through Central Wisconsin, though Mr. Nelson speaks of it as less abundant than the last. He also speaks of its breeding near the Calumet river.

Food: Of four stomachs examined, three contained ten insects; and one, a few seeds.

Larvæ, shellfish and insects on salt marshes (Wilson). Small shellfish crustaceans, and insects found in pools of water (Samuels).

206. *ACTODROMAS BAIRDI*, COUES. **BAIRD'S SANDPIPER.** GROUP I. CLASS c.

This species occurs as an uncommon migrant with other Sandpipers, but I have never taken it.

207. *ACTODROMAS MACULATA* (V.), COUES. **PECTORAL SANDPIPER; JACK SNIPE.** GROUP I. CLASS c.

This is a common migrant, occurring along the rocky banks of streams and on marshes, sometimes in large flocks.

Food: Of three specimens examined, two had eaten snails (*Physa*); one, three aquatic larvæ, and one; some vegetable matter.

Various insects found in its haunts, particularly grasshoppers and crickets (Samuels). Beetles, larvæ and common green *Ulva latissima*, as well as small seaweeds (Audubon).

208. *ACTODROMAS BONAPARTII* (SCHL.), COUES. **WHITE-RUMPED SANDPIPER.** GROUP I. CLASS c.

This is another of the rarer migrant Sandpipers with which I have not met.

Food: Various small aquatic animals, aquatic larvæ and insects.

209. *ARQUATELLA MARITIMA* (BRÜNN.), BD. **PURPLE SANDPIPER.** GROUP I.
CLASS c.

Dr. Hoy says of this species: "Greatly abundant from 15th of April to 20th of May. Mr. Nelson, however, finds it a very rare visitant in Northeastern Illinois. I have not seen it.

Small shellfish, shrimps and worms (Audubon).

210. *PELIDA ALPINA AMERICANA* (CASS.), ALLEN. **AMERICAN DUNLIN.**
GROUP I. CLASS c.

Mr. Nelson speaks of this species as a very abundant migrant which passes northward along the lake shore in flocks often containing hundreds of individuals. Mr. Thure Kumlien has taken it on Lake Koshkonong, but it has not been my good fortune to meet with it.

Food: Small worms and insects found in muddy flats (Wilson). Small marine animals (Samuels).

211. *TRINGA CANUTUS*, LINN. **RED-BREASTED SANDPIPER; ROBIN
SNIPE. GROUP I. CLASS c.**

A rare migrant. No specimens obtained.

Food: A bivalve found on the shores (Wilson). Worms and minute shells (De Kay).

212. *CALIDRIS ARENARIA*, LINN. **SANDERLING. GROUP I. CLASS c.**

Dr. Hoy and Mr. Nelson speak of this species as abundant along the lake shore during the migrations. It was not obtained by me.

Food: Principally bivalves common on the ocean beach (Wilson). Small shells and crustaceans (Samuels). Small sea-worms, shrimps and shellfish (Audubon).

213. *LIMOSA FEDA* (LINN.), ORD. **GREAT MARBLED GODWIT. GROUP I.
CLASS c.**

A rather common migrant, as reported by Mr. Nelson.

Food: Aquatic insects, leeches, small marine mollusks, crabs and worms (De Kay). Small Fiddler crabs (Audubon).

214. *LIMOSA HAEMASTICA* (LINN.), COUES. **HUDSONIAN GODWIT. GROUP I.
CLASS c..**

This species is included on the authority of Mr. Nelson, who speaks of it as not very rare during the migrations.

215. *SYMPHEMIA SEMIPALMATA* (GM.), HARTL. **SEMIPALMATED TATTLER;
WILLET. GROUP I. CLASS c.**

Mr. Nelson mentions this species as a rare summer resident in Northeastern Illinois, and Dr. Hoy reports having seen it as late as June 10th.

Food: Small shellfish, marine worms and aquatic insects (Wilson). Aquatic insects, Fiddler and other small crabs (Audubon).

216. *TOTANUS MELANOLEUCUS* (GM.), V. **GREATER TATTLER; STONE
SNIPE. GROUP I. CLASS c.**

The Greater Tattler probably breeds sparingly in the state as it is said to do in Illinois.

Food: One specimen examined had in its stomach seven water-beetles.

Marsh insects, shrimps, etc. (De Kay).

217. *TOTANUS FLAVIPES* (GM.), V. **LESSER TATTLER; YELLOWSHANKS.
GROUP I. CLASS c.**

This species is more abundant than the last and a few are summer residents and probably breed.

Food: Of three specimens examined, one had eaten five beetles and three other insects; and one, a rat-tailed maggot (*Eristalis?*), and a dragon-fly. The stomach of the third was empty.

Small aquatic insects and worms (De Kay). Small fish, worms, shrimps and aquatic insects (Audubon).

218. *RHYACOPHILUS SOLITARIUS* (WILS.), BP. **SOLITARY TATTLER.**
GROUP I. CLASS c.

A common migrant and also a summer resident in small numbers. It frequents small brooks with dry stony banks, as well as the marshy ponds.

Food: Of nine specimens examined, one had eaten a caterpillar; one, the larvæ of an aquatic beetle; one a grasshopper; one, a diptera; four, nine larvæ; three, eight aquatic beetles; five, ten other insects; and one, three hair-worms (*Gordii*).

Larvæ of various aquatic insects (Samuels). It is expert in catching insects on the wing, especially the small dragon-flies. I have found in their stomachs aquatic insects, caterpillars and various kinds of black spiders (Audubon).

219. *TRINGOIDES MACULARIUS* (LINN.), GR. **SPOTTED TATTLER; SPOTTED SANDPIPER.** GROUP I. CLASS c.

This is a very common summer resident, frequenting the banks of streams and ponds, laying its eggs in dry sandy and sometimes stony places.

Food: Of nine specimens examined, three had eaten fifteen beetles; one, two small dragon-flies; one, a grasshopper; and six, twenty-seven other insects; one had eaten eight hair-worms (*Gordii*); and one, three mollusks.

Insects and worms (De Kay).

220. *BARTRAMIA LONGICAUDA* (BECHST.), COUES. **BARTRAMIAN TATTLER; UPLAND PLOVER.** GROUP I. CLASS b.

No member of our wading birds has departed as far from ancestral customs in the search for food as this species. It seems to have abandoned very largely, if not altogether, the muddy shores cherished by its allies, and taken to the dry marshes and broad prairies. It is very abundant on the broad, dry prairies of Minnesota, and is a common summer resident with us. This change of habit introduces it into a band of workers much more closely related to agricultural interests. It is not much hunted for its flesh, and doubtless should not be until it assumes a greater abundance with us than it has at present.

Of three specimens examined, one had eaten six ants, two larvæ and three beetles; one, four snails; and one, three grasshoppers.

Beetles and other winged insects (Wilson). Grasshoppers (De Kay). In the fall, grasshoppers, crickets, grains and seeds (Samuels). Mainly insects, especially grasshoppers, of which they must devour enormous quantities in the aggregate. They also feed on other small animal substances, as well as upon various berries (Coues).

221. *TRYNGITES RUFESCENS* (V.), CAB. **BUFF-BREASTED SANDPIPER.**
GROUP I. CLASS c.

Mr. Nelson speaks of it as a very rare migrant in Northern Illinois. I have never met with it. Dr. Hoy reports it as having been formerly quite common in the fall.

222. *NUMENIUS LONGIROSTRIS*, WILS. **LONG-BILLED CURLEW.** GROUP I.
CLASS c.

The Long-billed Curlew doubtless occurs regularly in the state as a migrant, but it is not common. It may still breed in the state, as it has been known to do so in Illinois as late as 1873.

Food: Mainly crabs; also snails and bramble berries (Wilson). Small shells, insects, worms, crabs and berries (De Kay). Principally small Fiddler crabs; also sea-worms, salt-water shellfish and other animals (Audubon).

223. NUMENIUS HUDSONICUS, LATH. HUDSONIAN CURLEW. GROUP I.
CLASS c.

A very rare migrant.

Food: Small worms and shells; also bramble berries (Wilson). Aquatic insects, worms, small marine mollusks and seeds of aquatic plants (De Kay). Grasshoppers and berries (Nuttall).

224. NUMENIUS BOREALIS (FORST.), LATH. ESKIMO CURLEW. GROUP I.
CLASS c.

This species has not been taken by the writer, but Mr. Nelson mentions it as a rather common migrant in Illinois.

Food: In autumn, in Massachusetts, grasshoppers and berries; in Labrador, curlew-berries (Audubon). Curlew-berry (*Empetrum nigrum*) and small snails. The first is their principal and favorite food (Coues).

FAMILY TANTALIDÆ: IBISES, ETC.

225. TANTALUS LOCULATOR, LINN. WOOD IBIS. GROUP II. CLASS b.

In regard to this species Mr. Nelson says: "An exceedingly rare summer visitant from Southern Illinois." "Dr. Hoy has a specimen in his collection obtained at Racine, September 10, 1869, and states that a second specimen was obtained near Milwaukee, and is now in a museum at that place."

Food: Fish, reptiles, young alligators, frogs (Wilson). Entirely fish and aquatic reptiles, of which it destroys more than it can eat. Frogs, young alligators and water snakes (Coues from Audubon). Frogs, young alligators, wood rats, young Rails, Grackles, Fiddler and other crabs, snakes and small turtles (Audubon).

FAMILY GRUIDÆ: CRANES.

226. GRUS AMERICANA (LINN.), TEMM. WHITE CRANE; WHOOPING CRANE. GROUP II. CLASS c.

This species was formerly a common migrant along the western margin of the state, but now moves north and south, farther west, largely, if not altogether.

Food: Marine worms, insects, grains, mice, moles and rats (Wilson).

227. GRUS CANADENSIS (LINN.), TEMM. NORTHERN SANDHILL CRANE.
GROUP II. CLASS c.

This species was formerly abundant in the state, and some used to breed here. It appears, however, to have taken the Dakota fever and gone west, like other people, to take up new claims.

It is rarely indeed now that we hear that cry, which only a Crane can make, come down through the still air from a mere mote floating in the sun, high above the clouds.

Food: "Sandhill Cranes stalk over the prairies to spear them (grasshoppers) by the thousands" (Coues). Am. Nat., Vol. VIII, p. 282.

FAMILY ARDEIDÆ: HERONS.

FIG. 144.



GREAT BLUE HERON (*Ardea herodias*). From Tenney's Zoology.

228. ARDEA HERODIAS, LINN. GREAT BLUE HERON. GROUP II. CLASS c.

The Great Blue Heron is a common summer resident throughout the state, and is often, though incorrectly, called the Blue Crane. Its favorite resorts are slow streams and muddy lakes. Here it is known as an expert fisherman, who finds a ready market at no more distant port than his own capacious stomach,

which is reached by a thoroughfare of alarming capabilities. I removed from the stomach of one of these birds a bullhead eight and one-half inches in length. The fish had been swallowed entire, and with those ridged side spines set at right angles to its body. Another bird had eaten two sunfish and five dragon-fly larvæ.

Food: Fish, mice, dragon-flies and seeds of spatter-dock. It has been known to eat fifty moderate sized dace and roach in one day. In a carp pond one has been known to eat one thousand stonecarp in one year (Wilson). Crabs, eels, shellfish and various fishes (De Kay). Snakes, frogs, mice, fishes and insects (Samuels). Fish of all kinds, frogs, lizards, snakes, birds, shrews, meadow mice, young rats, aquatic insects, moths and dragon-flies. It destroys great numbers of Marsh Hens, Rails and other birds (Audubon).

229. *HERODIAS EGRETTE* (GM.), GR. **GREAT EGRET.** GROUP II. CLASS c.

This beautiful bird is a not uncommon summer resident, but much more retiring and shy than the last species.

Food: Frogs, lizards, small fish, mice, moles and insects (Wilson). Frogs, salamanders, mice, moles, snakes, etc. (De Kay).

230. *BUTORIDES VIRESCENS* (LINN.), CAB. **GREEN HERON.** GROUP II. CLASS c.

This is a common summer resident which frequents the banks of wooded streams more than any other situation.

The large number of dragon-fly larvæ observed in the stomachs of some of these birds is an unpleasant record to make.

Food: Of five specimens examined, two had eaten ten water scorpions; two, five beetles; one, two dragon-flies; two, fifteen dragon-fly larvæ; and two, four small fish.

Lizards, frogs, small fish, crabs, various worms and larvæ, particularly those of dragon-flies (Wilson). Reptiles and fishes (De Kay).

231. *NYCTIARDEA GRISEA NÆVIA* (BODD.), ALLEN. **AMERICAN NIGHT HERON.** GROUP II. CLASS c.

This species occurs in the state and is said to breed across the line in Lake county, Illinois. I have not met it alive. Mr. Thure Kumlien writes me that he received two specimens of this species from Stoughton, September 27, 1876.

Food: Small fish (Wilson). Fish, aquatic reptiles, grasshoppers, large insects and sea lettuce (De Kay). Herrings, pickerel, eels (Samuels). Fish, shrimps, tadpoles, frogs, water lizards, leeches, all kinds of water insects, moths, and even mice (Audubon).

232. *BOTAURUS MUGITANS* (BARTR.), COUES. **AMERICAN BITTERN.** GROUP II. CLASS c.

The American Bittern, or Stake-driver, as it is often called, is the most abundant of all our Herons and the least retiring. It is found in all meadows during the summer where there are small sloughs.

Food: Of four specimens examined, two had eaten eight small fish; one, a crawfish; one, a water-scorpion; one, a large water beetle; one, thirteen dragon-flies; one, a spider and its egg case; one, a meadow mouse; and four, six crawfish.

Meadow mice, aquatic reptiles and fish; also large winged insects (De Kay). Fish, frogs, other reptiles and insects (Samuels). Mollusks, lizards, frogs, small snakes, and fish as well as insects (Coues).

233. *ARDETTA EXILIS* (GM.) GR. **LEAST BITTERN.** GROUP II. CLASS c.

This is a common summer resident, but a very retired species, confining itself among the reeds of swamps and lakes.

Food: Of four specimens examined, one had eaten five beetles and two other insects; one, a water-scorpion and twenty water-boatmen; one, four insects and a dragon-fly; and one, a small fish.

Small fish (Wilson). Snails, slugs, tadpoles, water lizards, small shrews, and occasionally field-mice (Audubon).

FAMILY RALLIDÆ: RAILS.

234. *RALLUS ELEGANS*, AUD. **KING RAIL; FRESH MARSH HEN.**
GROUP I. CLASS c.

I have seen but a single specimen of this species. It was observed among the reeds on Cold Spring pond, in Jefferson county.

Food: Grass seeds, insects, tadpoles, leeches, small cray-fish (Audubon).

235. *RALLUS VIRGINIANUS*, LINN. **VIRGINIA RAIL.** GROUP I. CLASS a.

This is a common summer resident, frequenting damp meadows and reedy ponds.

Food: One specimen examined had eaten five snails.

Small snails, worms, larvæ of insects (Wilson). Worms, aquatic insects, fresh-water shells and seeds of grasses (De Kay). Various insects and worms (Samuels). Small slugs, snails, aquatic insects, worms, crustaceans and seeds of grasses (Audubon).

236. *PROZANA CAROLINA* (LINN.), V. **CAROLINA RAIL; CAROLINA CRAKE.** GROUP I. CLASS c.

This species is very abundant in all suitable places throughout the summer. Its favorite haunts are the sloughs, reedy lakes and ponds and the marshy banks of streams.

Food: Of seven specimens examined, six had fed upon seeds; two had eaten six snails; two, two beetles; one, two leaf-hoppers. Two had fed upon duck-weed.

Seeds of reeds (Wilson).

237. *PROZANA NOVEBORACENSIS* (GM.), CASS. **YELLOW RAIL; YELLOW CRAKE.** GROUP I. CLASS c.

This species is mentioned by Mr. Nelson as not very rare in Northeastern Illinois, where it breeds. Dr. Hoy reports it as breeding in the state. I have not seen it.

Food: Aquatic insects and seeds (De Kay).

238. *GALLINULA GALEATA* (LICHT.), BP. **FLORIDA GALLINULE.** GROUP I.
CLASS c.

A common summer resident. It frequents weedy ponds in various parts of the state.

Food: Of seven specimens examined six ate forty-two snails; one, three water-scorpions; and two, other insects. Six ate seeds; four, duck-weed; and four, water crowfoot.

239. *IONORNIS MARTINICA* (LINN.), REICH. **PURPLE GALLINULE.** GROUP I.
CLASS c.

This species is introduced here on the authority of Mr. Nelson, who says: "Dr. Hoy informs me of its capture near Racine."

240. *FULICA AMERICANA*, GM. **AMERICAN COOT.** GROUP I. CLASS c.

The Coot, like the Florida Gallinule, is an abundant summer resident which frequents similar situations, but I have never observed the two species together.

Food: Of two specimens examined only algæ were noted as occurring in the stomachs.

Various aquatic plants, seeds, insects, and, it is said, small fish (Wilson).

FAMILY ANATIDÆ: SWAN, GEESE AND DUCKS.

241. *CYGNUS BUCCINATOR*, RICH. **TRUMPETER SWAN.** GROUP I. CLASS c.

A rather rare migrant.

242. *CYGNUS COLUMBIANUS* (ORD.), COUES. **AMERICAN SWAN.** GROUP I.
CLASS c.

A rather common migrant.

243. *ANSER ALBIFRONS GAMBELI* (HARTL.), COUES. **AMERICAN WHITE-FRONTED GOOSE.** GROUP I. CLASS c.

An abundant migrant.

Food: Beech-nuts, corn, acorns, young blades of grass. In their gizzards I have found fishes, water lizards and snails (Audubon).

It frequents the corn-fields in Central Illinois, where hundreds are killed and shipped to the markets (E. W. Nelson).

244. *CHEN CŒRULESCENS* (LINN.), RIDG. **BLUE GOOSE.** GROUP I. CLASS c.

This species is introduced here on the authority of a statement of Mr. Nelson, who says many are sent to the Chicago markets with the preceding during the migrations.

245. *CHEN HYPERBOREUS* (PALL.), BOIE. **SNOW GOOSE.** GROUP I. CLASS c.

This species is common during the migrations.

Food: Rushes, insects in autumn, and berries, particularly *Empetrum nigrum* (Richardson). Roots of reeds (Wilson). It frequents the corn-fields in Central Illinois (E. W. Nelson).

246. *CHEN HYPERBOREUS ALBATUS* (CASS.), RIDG. **LESSER SNOW GOOSE.**
GROUP I. CLASS c.

This Goose moves north and south with the last during the migrations, and in about equal numbers.

Food: It frequents the corn-fields in Central Illinois (E. W. Nelson). In speaking of the two varieties together, Dr. Coues says: "Various kinds of ordinary grass form a large part of this bird's food, at least during their winter residence in the United States. They also eat the bulbous roots and soft succulent culms of aquatic plants."

247. *BERNICLA BRENTA* (PALL.), STEPH. **BRANT GOOSE.** GROUP I. CLASS c.

Mr. Nelson states that the only instance known to him of the capture of this species in this portion of the country, is a specimen taken by Dr. Hoy near Racine, which is in his collection. Mr. Paul B. Wood writes me that he has taken this Goose near Peshtigo.

248. *BERNICLA CANADENSIS* (LINN.), BOIE. **CANADA GOOSE; COMMON WILD GOOSE.**

249. *BERNICLA CANADENSIS HUTCHINSI* (RICH.), COUES. **HUTCHINS' CANADA GOOSE.** GROUP I. CLASS c.

Both of these varieties are common migrants.

Food: Green leaves of sea cabbage, roots of sedges (Wilson). Fond of lighting in corn-fields and feeding on fresh blades, often committing great havoc; grass and earth-worms (Audubon).

250. *ANAS BOSCAS*, LINN. **MALLARD.** GROUP I. CLASS c.

A very abundant migrant and still a summer resident. They are becoming sensibly less numerous year by year, under the steady fire of sportsmen. Many breed about Lake Puckawa, and in many other similar places.

Food: Purely omnivorous. Putrid fish, garbage of all sorts, snakes, small quadrupeds, nuts and fruits of all kinds, rice, corn and other grains. They are expert fly-catchers (Audubon).

251. *ANAS OBSCURA*, GM. **DUSKY DUCK.** GROUP I. CLASS c.

The Dusky Duck is a rather uncommon migrant and probably breeds very sparingly.

Food: Small snails (Wilson).

252. *DAFILA ACUTA* (LINN.), JEN. **PINTAIL; SPRIGTAIL.** GROUP I. CLASS c.

A common migrant, often associated with the Mallards.

Food: Beech-nuts (Audubon).

253. *CHAULELASMUS STREPERUS* (LINN.), GR. **GADWALL.** GROUP I. CLASS c

A rather common migrant.

Food: Small fish, shells and aquatic plants (De Kay). Tender shoots and blades of grasses, beech-nuts and acorns, seeds of all kinds, tadpoles, small fish and leeches; sometimes alights in corn-fields for corn (Samuels from Audubon).

254. *MARECA PENELOPE* (LINN.), SELBY. **EUROPEAN WIDGEON.** GROUP I.
CLASS c.

Mr. Nelson in his Birds of Northeastern Illinois has the following: "Exceedingly rare straggler. It has also been shot on Lake Mendota in Wisconsin by Mr. Kumlien (Hoy)."

255. *MARECA AMERICANA* (GM.), STEPH. **AMERICAN WIDGEON.** GROUP I.
CLASS c.

A common migrant.

Food: Tender roots of aquatic plants (Wilson). Chiefly aquatic vegetables (De Kay). Principally tender roots and leaves of aquatic plants (Samuels).

256. *QUERQUEDULA CAROLINENSIS* (GM.), STEPH. **GREEN-WINGED TEAL.**
GROUP I. CLASS c.

This exquisite Duck is a common migrant and summer resident. It breeds about Lake Puckawa, and near Berlin, and doubtless elsewhere in similar situations.

Food: Feeds on various kinds of grass; also leaves of tender vegetables (Wilson). Various water insects and their larvæ, seeds of aquatic plants, and tadpoles of different frogs (Samuels). Seeds of grasses, small acorns, fallen grapes and berries, aquatic insects, worms and snails (Audubon).

257. *QUERQUEDULA DISCORS* (LINN.), STEPH. **BLUE-WINGED TEAL.**
GROUP I. CLASS c.

This is our most common summer resident, breeding in large numbers in most suitable places.

Food: Of four specimens examined, three had eaten sixty snails; one, vegetable matter; and one, seeds and duck-weed.

Seeds and vegetable food (Wilson). Aquatic insects and seeds of aquatic plants (Samuels).

258. *SPATULA CLYPEATA* (LINN.), BOIE. **SHOVELLER; SPOONBILL DUCK.**
GROUP I. CLASS c.

A rather common migrant. It may also breed in the state, as it is said to do so in Illinois.

Food: Various aquatic insects and tadpoles, but eats but few seeds of aquatic plants; small crustaceans (Samuels).

259. *AIX SPONSA* (LINN.), BOIE. **WOOD DUCK; SUMMER DUCK.** GROUP I.
CLASS c.

This handsome Duck breeds in abundance along Bark river and about small wooded lakes south and east of Whitewater, as well as along the wooded streams in Northern Wisconsin, and doubtless generally in similar situations.

Food: Of five specimens examined, one had eaten two dragon-flies and three water-larvæ; three, black cherries; one, burr oak acorns; and three, seeds.

Seeds of wild oats, acorns and insects (Wilson). Acorns, seeds of aquatic plants and insects (De Kay). Food of young, aquatic insects, flies, mosquitoes and seeds. When older they chase dragon-flies, or pick up locusts that have fallen into the stream. Old birds eat acorns, beech-nuts, grapes, berries and rice; insects, snails, tadpoles and lizards.

260. *FULIGULA MARILA* (LINN.), STEPH. **GREATER BLACK-HEAD; SCAUP DUCK.** GROUP I. CLASS c.

Not a common migrant.

Food: Shell-fish (Wilson). Small fry, cray-fish, grass that grows along river beds (Audubon).

261. *FULIGULA AFFINIS* (EYT.), **LESSER BLACK-HEAD; BLUE-BILL.** GROUP I. CLASS c.

This is an abundant migrant which breeds in small numbers about Berlin and doubtless in other parts of the state.

Food: Small fry, cray-fish, and grasses which grow along beds of rivers (Audubon from Samuels).

262. *FULIGULA COLLARIS* (DONOV.), BP. **RING-NECK; BLACK-HEAD.** GROUP I. CLASS c.

This Duck is also an abundant migrant which is associated with the last, and doubtless a few breed with us as they do in Northeastern Illinois.

263. *FULIGULA FERINA AMERICANA* (EYT.), COUES. **AMERICAN POCHARD; RED-HEAD.** GROUP I. CLASS c.

A rather common migrant.

Food: Stems and roots of *Vallisneria*, various aquatic plants, small fish, aquatic insects (Samuels).

264. *FULIGULA VALLISNERIA* (WILS.), STEPH. **CANVAS-BACK.** GROUP I. CLASS c.

A common migrant. Many are shot on Lake Puckawa.

Food: Roots of *Vallisneria* (Wils.) *Vallisneria* (De Kay).

265. *CLANGULA GLAUCIUM* (LINN.), BREHM. **GOLDEN-EYE; GANOT.** GROUP I. CLASS c.

A common migrant. Most abundant about the large lakes. Some are known to winter on Lake Michigan, north of Chicago.

Food: Shellfish and small fry (Wilson). Small fish and aquatic plants (Samuels).

266. *CLANGULA ISLANDICA* (GM.), BP. **BARROW'S GOLDEN-EYE.** GROUP I. CLASS c.

Mr. Nelson reports this species as a winter resident on Lake Michigan, and states that Dr. Hoy writes that a specimen was shot at Racine during the winter of 1860.

267. *CLANGULA ALBEOLA* (LINN.), STEPH. **BUFFLE-HEAD; BUTTER-BALL; SPIRIT DUCK.** GROUP I. CLASS c.

A common migrant and more abundant than the preceding members of this genus. It remains upon our streams until they are frozen over, and it is among the first to return in the spring.

Food: Shellfish, shrimps, etc. (Wilson). Aquatic vegetables and insects (De Kay). Small fish and crustaceans (Samuels).

268. *HARELDA GLACIALIS* (LINN.), LEACH. **LONG-TAILED DUCK; OLD WIFE.** GROUP I. CLASS c.

An abundant migrant and winter resident upon Lake Michigan.

Food: One specimen obtained at Ithaca, New York, October 30th, had in its stomach only small mollusks.

Small shellfish (Wilson).

269. *HISTRIONICUS MINUTUS* (LINN.), COUES. **HARLEQUIN DUCK.** GROUP I. CLASS c.

Of this species Mr. Nelson says: "Rather rare winter resident upon Lake Michigan. Dr. Hoy has secured specimens at Racine."

Food: Shrimps, shellfish, roe, aquatic insects and mollusca (Audubon).

270. *SOMATERIA MOLLISSIMA* (LINN.), BOIE. **EIDER DUCK.** GROUP I. CLASS c.

This species is included in Mr. Nelson's list, and he there states that Dr. Hoy informs him that a specimen was obtained at Racine in January, 1875.

271. *SOMATERIA SPECTABILIS* (LINN.), BOIE. **KING EIDER.** GROUP I. CLASS c.

Mr. Nelson says: "A single specimen has been taken at Milwaukee, and is preserved at that place (Hoy)."

The three following species are reported by Mr. Nelson as winter residents in Illinois. From this it may be expected that they are at least migrants with us, unless in their movements they pass across the state without alighting, or go to the east of it: *Ædemia Americana*, Gro.; *Ædemia fusca* (Linn.), Flem.; *Ædemia perspicillata* (Linn.), Flem.

272. *ERISMATURA RUBIDA* (WILS.), BP. **RUDDY DUCK.** GROUP I. CLASS c.

A common migrant. Mr. Nelson mentions the occurrence of this species in Northeastern Illinois during the breeding season.

Food: Marine and fresh-water plants and seeds (De Kay). Shell-fish and mollusks (Samuels).

273. *NOMONYX DOMINICA* (LINN.), RIDG. **ST. DOMINGO DUCK.** GROUP I. CLASS c.

Mr. Thure Kumlien has reported this species from Wisconsin (Coues).

274. *MERGUS MERGANSER*, LINN. **MERGANSEER; GOOSANDER.** GROUP I. CLASS c.

A common migrant.

Food: Fish, aquatic reptiles, shells, cray-fish, etc. (De Kay).

275. *MERGUS SERRATOR*, LINN. **RED-BREASTED MERGANSEER.** GROUP II. CLASS c.

Not a very common migrant.

Food: Small fry and shellfish (Wilson).

276. MERGUS CUCULLATUS, LINN. HOODED MERGANSER. GROUP II. CLASS c.

This handsome species is an abundant migrant. We met with small flocks of them upon the small lakes in Northeastern Wisconsin during the month of October, 1877.

Food: One specimen shot at Boulder Lake had in its stomach small seeds, shells and vegetable matter.

Fresh-water insects and their larvæ. It is an expert fisherman (Samuels). Snails, tadpoles and insects (Audubon).

FAMILY PELECANIDÆ: PELICANS.**277. PELECANUS TRACHYRHYNCHUS, LATH. AMERICAN WHITE PELICAN. GROUP II. CLASS c.**

This large scoop-net fisherman was formerly a common migrant throughout the state, but at present moves north along the Mississippi and further west. There is a specimen in the cabinet of the River Falls State Normal School; which was obtained near St. Paul.

Food: A specimen shot on Cayuga Lake, N. Y., in the spring of 1864, had in its stomach two sunfish (*Pomotis vulgaris*), one, six, and the other eight inches long, and two bullheads (W. J. Beal, Am. Nat.).

FAMILY GRACULIDÆ: CORMORANTS.**278. PHALACROCORAX DILOPHUS (SW.), NUTT. DOUBLE CRESTED CORMORANT. GROUP II. CLASS c.**

A regular migrant, but not very common.

Food: Shrimps and various kinds of fish (Audubon).

FAMILY LARIDÆ: GULLS, ETC.**279. LARUS GLAUCUS, BRÜNN. GLAUCUS GULL. GROUP II. CLASS c.**

Mr. Nelson speaks of this species as a rare winter visitant to Lake Michigan, and states that Dr. Hoy has killed three specimens upon the lake near Racine.

280. LARUS ARGENTATUS SMITHSONIANUS, COUES. SMITHSONIAN HERRING GULL. GROUP II. CLASS c.

A migrant and winter resident on Lake Michigan. Dr. Hoy records it as common on the lakes. Mr. Nelson states that a colony breed on an island between Green Bay and Lake Michigan.

Food: It consists principally of herrings, of which they destroy great numbers; also other fish, shrimps, crabs, shellfish, as well as young birds and small quadrupeds. They suck all the eggs they can find. The young are fed chiefly upon shrimps and small crustacea (Audubon).

281. *LARUS DELAWARENSIS*, ORD. **RING-BILLED GULL.** GROUP II.
CLASS c.

A rather common migrant, and, with the last, was obtained at Whitewater.

282. *RISSA TRIDACTYLA* (LINN.), BP. **KITTIWAKE GULL.** GROUP II.
CLASS c.

Of this species Mr. Nelson writes: "A rare winter visitant to Lake Michigan. Dr. Hoy writes that in the winter of 1870 a single specimen of this species kept about the harbor for several days, but was too shy to be shot."

283. *CHROICOCEPHALUS FRANKLINI* (RICH.), BRUCH. **FRANKLIN'S ROSY GULL.** GROUP II. CLASS c.

Dr. Hoy states that a specimen was obtained at Milwaukee and is preserved in a collection at that place (Nelson). Mr. E. S. Richmond writes me that he has obtained it at Whitewater.

284. *CHROICOCEPHALUS PHILADELPHIA* (ORD.), LAWR. **BONAPARTE'S ROSY GULL.** GROUP II. CLASS c.

An abundant migrant.

Larus leucopterus, *L. marinus*, *L. argentatus* and *Chroicocephalus atricilla* are other Gulls included by Mr. Nelson in his "Birds of Northeastern Illinois." Both Dr. Hoy and Mr. Nelson allege they have seen specimens of *Xema Sabinii*, which they did not secure.

285. *STERNA MAXIMA*, BODD. **ROYAL TERN.** GROUP II. CLASS c.

A specimen was taken at Milwaukee many years since and preserved in a museum there (Hoy from Nelson).

286. *STERNA HIRUNDO*, LINN. **COMMON TERN; SEA SWALLOW.**
GROUP II. CLASS c.

A rather common migrant.

287. *STERNA FOSTERI*, NUTT. **FOSTER'S TERN.** GROUP II. CLASS c.

This is a summer resident and not very rare. I am confident that I have seen it five times, though I have never obtained a specimen.

Sterna anglica and *Sterna caspia* are included in Mr. Nelson's list. I believe that I saw the first species at Berlin. *Sterna superciliaris* is also included.

288. *HYDROCHELIDON LARIFORMIS* (LINN.), COUES. **BLACK TERN.** GROUP I.
CLASS c.

This is a very abundant summer resident and is to be found about most of our sloughs and weedy lakes in large numbers.

Food: Of six specimens examined, three had eaten six dragon-fly larvæ; three, six water-scorpions; one, eight dipterous insects; and three, twelve other insects.

Grasshoppers, crickets, beetles, spiders and other insects floating on the water: (Samuels). Follows the plow for earth-worms and larvæ (E. W. Nelson.)

FAMILY **COLYMBIDÆ**: LOONS.289. **COLYMBUS TORQUATUS**, BRÜNN. **GREAT NORTHERN DIVER.** GROUP II. CLASS c.

This large species is still not uncommon, but is steadily retiring. It is a summer resident and breeds regularly.

Food: Fish (Wilson).

290. **COLYMBUS ARCTICUS.** **BLACK-THROATED DIVER.** GROUP II. CLASS c.

In regard to this species Mr. Nelson says: "A very rare winter visitant on Lake Michigan. There is a specimen in Dr. Hoy's collection, taken at Racine, and a second specimen was captured and preserved at Milwaukee.

291. **COLYMBUS SEPTENTRIONALIS**, LINN. **RED-THROATED DIVER.** GROUP II. CLASS c.

Said to be not uncommon during the winter on Lake Michigan.

FAMILY **PODICIPIDÆ**: GREBES.292. **PODICIPES CORNUTUS** (GM.), LATH. **HORNED GREBE.** GROUP II. CLASS c.

A migrant not very common. A specimen was taken at Berlin, May 4, 1874, and is now in the High School Cabinet.

Food: Insects, fishes, crabs, fresh and salt water shells (De Kay). On salt water, shrimps, fishes and crabs; on fresh water, insects, leeches, small frogs, tadpoles and aquatic insects (Audubon).

293. **PODICIPES GRISEIGENA HOLBÆLLI** (REINH.), COUES. **AMERICAN RED-NECKED GREBE.** GROUP II. CLASS c.

Said to be rare and found only in winter on Lake Michigan.

Food: Smallest fry, amphibians, reptiles, insects and vegetables (Audubon).

294. **PODICIPES AURITUS** (LINN.), LATH. **EUROPEAN EARED GREBE.** GROUP II. CLASS c.

Mr. Nelson speaks of this species as rather common on Lake Michigan in winter, and Dr. Hoy states that it nests on the margin of small lakes, and is a common species.

Food: Fish, aquatic insects, small reptiles and seeds of aquatic plants (Audubon).

295. **PODILYMBUS PODICIPES** (LINN.), LAWR. **RED-BILLED GREBE; DAB-CHICK.** GROUP II. CLASS c.

This is a very common species. A pair or more is to be found upon almost every pond and stream.

Food: Of six specimens examined, two contained fifteen dragon-fly larvæ; four, fifteen water-scorpions; one, seven shells; one, nine insects; one, a small bone; and every one a rather large pellet of feathers.

Small fry, plants, seeds, aquatic insects and snails (Audubon).





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and vine chafer was compensated by a general diminution of the ratios of all the other elements, and not by the neglect of one or two alone. If the latter had been the case, the criticism might easily have been made that the birds, in helping to reduce one oscillation, were setting others on foot.

"3. The fact that, with the exception of the indigo bird, the species whose records in the orchard were compared with those made elsewhere, had eaten in the former situation as many caterpillars other than canker worms as usual, simply adding their canker worm ratios to those of other caterpillars, goes to show that these insects are favorites with a majority of birds."

We notice the unexpected fact respecting *Fringillidæ*, that only 7 per cent of the food of 47 individuals of this "seed-eating" family, consisted of seeds, insects making up all but 2 per cent of the remainder. The canker worms alone made 40 per cent. But in this case it must be remembered that the circumstances were highly exceptional.

We trust Professor Forbes will not desist from his good work. Such exact data as these are just what is required for the solution of the general problem which is offered by the relations of the bird-world to agriculture. — E. C.

ECONOMIC RELATIONS OF BIRDS AGAIN.*—Upon the heels of Prof. Forbes's paper, but since the foregoing notice was penned (else the two contributions to the same subject might have been profitably considered together), comes the very elaborate result of Prof. King's examinations of the food of birds in its bearing upon our agricultural interests. The question,—one of great economic importance,—seems to be only of late brought forward with sufficient prominence; and it is evident from what these two investigators have accomplished, that our ornithologists have hitherto taken it up, if at all, only after methods entirely inadequate to its solution. Observations have usually been no more than incidental to our study of the habits of birds, instead of being sufficiently prolonged, exact and systematic to yield sound results. Prof. King's field-work, we are informed, was commenced in 1873, and is apparently only just concluded—his attention during this long period being steadily and rigidly directed to discovering what and how much food Wisconsin birds eat, with the view of classifying these birds in certain categories—primarily those beneficial to or injurious to, man in economic relations. This is certainly a worthy devotion, undertaken in truly scientific spirit, and carried out with an earnest purpose. It should go far toward accomplishing the desired result,—though we fear the problem is too intricate, involving too many unknown quantities, to be solved perfectly by never so many tabular statements of contents of birds' stomachs. We suspect that the general equation reduced to its simplest practical terms will prove in the end to be, that the fewer birds of all kinds killed the better for us.

* Economic Relations of Wisconsin Birds. By F. H. King. Wisconsin Geological Survey, Vol. I, chap. xi, pp. 441-610, figg. 103-144. Roy. 8vo.

"The facts recorded in this report were obtained from an examination of the contents of the stomachs of over 1800 birds, 1608 of which contributed results which have been incorporated in the report." The contents of one-half these stomachs were examined fresh, with the hand-lens, the rest more leisurely and in greater detail after transference to alcohol. "But had it been possible," says the author very truly, "to identify specifically the 7663 insects, etc., taken from the stomachs of these 1608 birds, this would have been by far the smallest part of the task set, for then it would be required to command a full and broad knowledge of the economic relations of the insects eaten. But with the difficulty solved, we must recognize still another, of greater magnitude and higher degree. Because of these great difficulties inherent in the task itself, and the ample grounds they present for difference of opinion in regard to final conclusions, it has seemed very desirable that there should be presented some of those general considerations which have served as guides to the classification adopted."

These considerations are therefore presented, and very elaborately, in the Introduction, which occupies some 30 pages. Bird-food, considered in its two broad categories of vegetal and animal, is farther ranged under the two leading classes of that, the consumption of which is on the whole (1) a service, or (2) an injury, to man. Beneficial services of birds are stated and discussed under the following propositions: A bird is beneficial when it feeds upon injurious (1) plants, (2) mammals, (3) birds, (4) reptiles, (5) insects [the real *crux* of the problem], (6) mollusks, (7) crustaceans and worms, (8) carrion. (We state it very broadly and tersely—the author's own propositions are elaborated and qualified in various ways.) On the other hand, a bird is injurious under nearly the same number of contrary conditions; as when (1) it destroys or injures useful plants; (2) preys on shrews, moles, and bats; (3) upon beneficial birds; (4) upon lizards and small snakes; (5) upon frogs, toads, and salamanders; (6) upon the parasites of noxious animals, especially noxious insects; (7) upon beneficial predaceous insects, spiders, and myriapods; (8) upon carrion insects; (9) upon beneficial worms. These numerous points receive due attention.

"When it is proposed to utilize birds as insect destroyers, to increase the abundance of certain species and to exterminate or hold in check others, to encourage the breeding of certain birds in given places and to prevent others from doing so; or, when it is proposed to introduce into a country a foreign species, other questions than those of food simply must be considered." Some of the more important of these are given by the author as: (1) The relations held by the bird to different industries; (2) its food and habits in different localities; (3) during different seasons; (4) when young and mature; (5) when and how long the bird is in a given locality; (6) its nesting place; (7) its other haunts; (8) its hours of feeding; (9) methods of obtaining food; (10) situations in which its food is obtained; (11) whether or not the bird does an important work which other birds are not fitted to do; (12) size and activity of the bird; (13) its gregariousness or the reverse; (14) its dexterity upon the wing; (15) its

general disposition; (16) its value as food to man; (17) its furnishing or not a habitat for troublesome parasitic entozoa; (18) its fecundity. The discussion of these various points leaves one in no doubt whatever that, whether or not the author has solved the problem, he has certainly sketched many of its factors, and mapped out a proper course of study.

Among "other considerations" with which the introduction continues are: (1) the changing habits of birds; (2) can they ever become abundant in thickly settled districts? (3) what birds, if left to themselves, are likely to become most abundant as the country grows older? (4) some birds may be injurious to a locality which they seldom or never visit (a curious fact — *e. g.*, destruction, during the migration, of useful birds of prey); (5) do birds of prey perform a necessary work by holding in check certain birds and noxious animals? (6) parasitism among birds; (7) the scientific, educational and æsthetic value of birds.

The Introduction closes with "a Temporary Classification of Wisconsin Birds on an economic basis," as follows:—

Group I. Birds whose habits, so far as they are known, render them, on the whole, beneficial.

(a) Birds whose known habits render them beneficial at all times.

(b) Birds which are known to be to some extent injurious, but whose known services exceed their known injuries.

(c) Birds whose flesh is valuable for food, and whose present abundance and slight usefulness as insect destroyers make it proper to permit their destruction as game.

Group II. Birds whose habits, so far as they are known, make it doubtful whether they are, on the whole, beneficial or injurious. (With three categories, *a*, *b*, *c*.)

Group III. Birds whose habits, so far as they are known, render them, on the whole, injurious.

(a) Birds whose known habits render them injurious at all times.

(b) Birds which are known to be to some extent beneficial, but whose known injuries exceed their known services.

It would certainly appear that most birds fall in group I, category (*a*) or (*b*) — happily for us and them!

A curious question is raised, How shall a bird's food be expressed numerically in terms of debit and credit? because neither relative volumes nor relative weights of beneficial or detrimental food-elements can express the true economic relations of the bird, any more than a peck of plums can be compared with a peck of curculios — any more than the destruction of 3000 phylloxera can be set against that of one coral-winged grass-hopper, as it would be if bulk for bulk were gauged. The author's method of meeting this difficulty, arising from the fact that we have no standard of insect values, is novel and ingenious, to say the least. It consists essentially in the use of heavy black *lines* of different lengths, showing graphically, not numerically, the ratios of animal or vegetal foods, of the several items of each, and particularly the ratios of "beneficial" and "detrimental" food-elements, and those undetermined in these respects.

The body of the report is primarily of the nature of an "local list" for the State of Wisconsin, giving in systematic order 295 species; nor must the claims of the paper in this regard be entirely overshadowed by the importance of its main object. Every bird is referred to one or another of the several "Groups" and subgroups above mentioned. The "tabular summaries of economic relations," expressed in the peculiar manner above noted, are given for such species in sets, according to families. The report is well-written, giving in many cases extended biographies, aside from those points which in each case of course engage the author's special attention. Besides detailed results of his own observations, statements of many other authors respecting the food of our birds is condensed and summarized. The numerous woodcuts are chiefly taken from Baird, Brewer, and Ridgway. The flavor of the author's personality is appreciable, as we were sure we should find it to be, after reading in the preface what Prof. King has to say of his "sojourn for six months in the sunshine of a warm heart;" and if we had the heart to pass any ungracious criticism upon so laborious, meritorious and interesting a report, the printer rather than the author would be our victim.—E. C.

3-4, 1882, 8, pp. 188-189. 107-110.

REPORT ON THE BIRDS OF OHIO.*—This long-deferred work reaches us at length in the form of a treatise on the ornithology of the State so extensive and so systematic that the time its preparation has occupied seems justified if not absolutely required. The inside history of the publication repeats that of most scientific work which struggles for existence in the meshes of official red-tape. It was begun in 1873, the author being given a year in which to complete it. In 1874, he was ready with an annotated and descriptive catalogue of his birds, which might have made perhaps pp. 100 of print. This was rewritten and extended in 1875; and again, in 1877-'8, with addition of the synonymatic and bibliographical matter, and the appendix. As appears by the date of the letter of transmittal, printing began in November, 1879, and continued to p. 352, January, 1880, when it was stopped till December, 1880, when it was resumed, with more or less prolonged interruptions until completed in the summer of 1881. Then the sheets appear to have been stored for a year or more before actual publication, which was late in 1882. The bird-matter appears in two forms—as a part of the whole volume, and as a small edition of separate extras—the latter, however, fortunately without repagination or any alteration whatever.

Though about a year and a half behindhand, and consequently without the finishing touches which the author's careful attention to the progress of the science during that period would doubtless have led him to give had circumstances permitted, Dr. Wheaton's report must at once take place at the head of State Faunas, so far as ornithology is concerned. It repre-

* Report on the Birds of Ohio. By J. M. Wheaton, M. D. Report of the Geological Survey of Ohio, Vol. IV, pt. i, pp. 188-628. Columbus, O. Nevins & Myers, State Printers. 8vo. 1882.

